ELECTRICAL REVIEW

FRIDAY
11 MARCH 1960

WEEKLY
PRICE 1s 6d

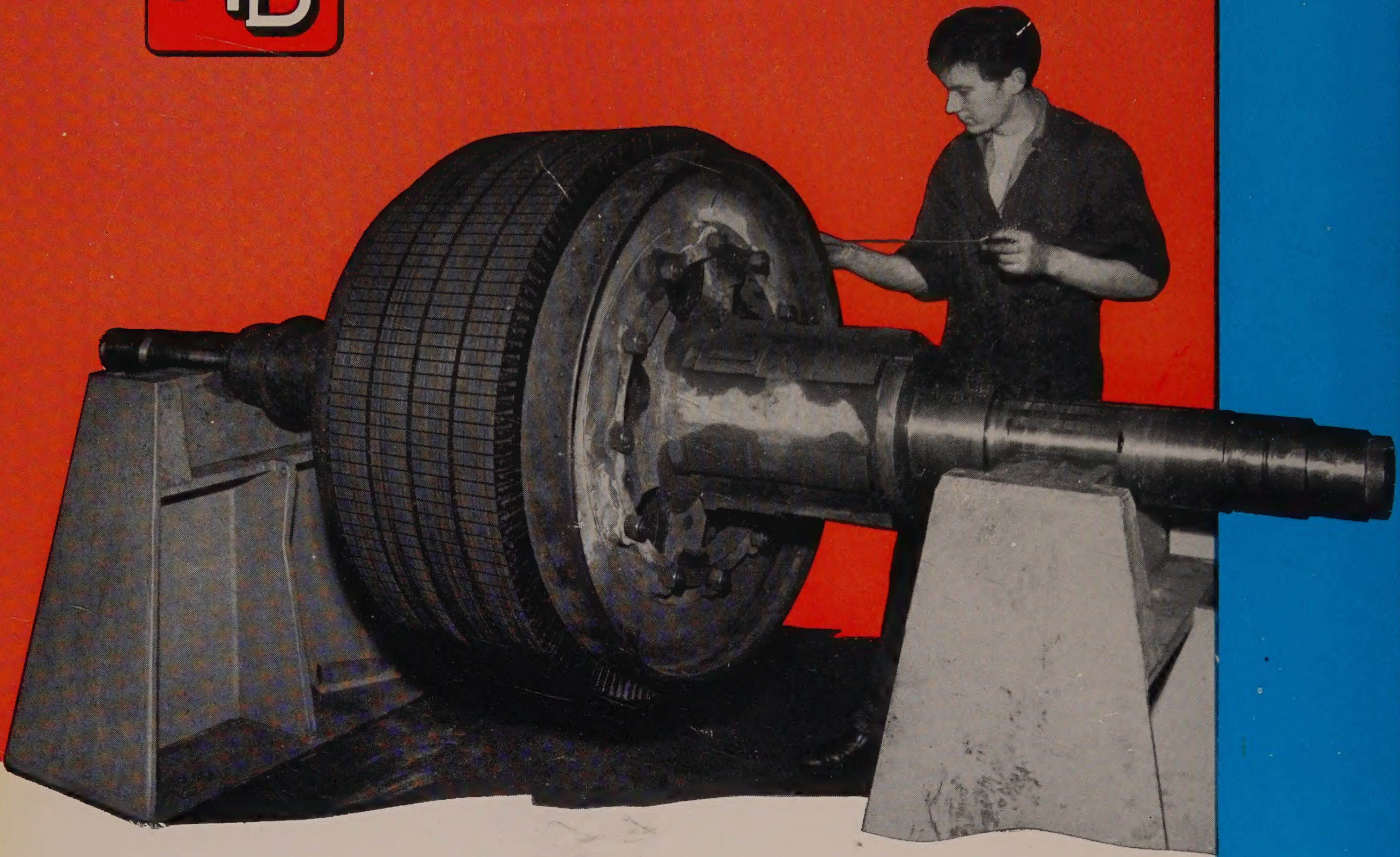
From Chelmsford . . .

where we make our . . . autosynchronous and salient pole synchronous motors up to 3000 H.P. ● A.C. induction motors from 300 H.P. to 5000 H.P. ● A.C. generators up to 5000 kVA all Crompton D.C. motors — the largest are 1200 H.P. ● all our D.C. generators — up to 900 kW ● and our Ward Leonard Sets and Frequency Changers.

Crompton Parkinson
LIMITED

ELECTRICAL EQUIPMENT

CROMPTON PARKINSON LIMITED · CROMPTON HOUSE, ALDWYCH, LONDON. W.C.2



Completed main exciter armature core for a 200 M.W. turbo-generator made by C. A. Parsons & Co. Ltd. for Toronto.

The core of a fine generator– with laminations by RTB

WE SPECIALIZE IN THE FOLLOWING:

LAMINATIONS of all types, in all sizes and in all grades of materials.

FERROSIL hot-rolled and cold-reduced electrical sheet and strip, and hot-rolled transformer sheet.

ALPHASIL cold-reduced oriented transformer sheet and strip.

Richard Thomas & Baldwins Limited

LAMINATION WORKS: Cookley Works, Brierley Hill, Staffs
MIDLAND SECTION OFFICE: Wilden, Stourport-on-Severn, Worcs
HEAD OFFICE: 47 Park Street, London, W.1

Our Cookley Works is one of the largest in Europe specializing in the manufacture of laminations for the electrical industry.

One of the laminations being notched on an indexing machine.

AVO INSTRUMENTATION

Pioneers in the design and manufacture of Multi-range Testing Instruments since 1923

AVO instruments are at the service of B.O.A.C. throughout the world

D.C. Amplifiers
Radiation Monitors
Valve Voltmeters
Multi-range Testmeters
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A MEMBER OF THE METAL INDUSTRIES GROUP OF COMPANIES

6

PUT UP SIELECT

Fluorescent Lighting Fittings

PULL DOWN LIGHTING COSTS

Here are three good reasons why *you* will be particularly interested in the new SIELECT range of fluorescent lighting fittings:

- Low first cost
- Easy to install and maintain
- Adaptable and reliable

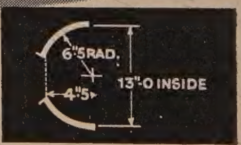
The range of models includes fittings both with and without reflectors and also an attractive reeded perspex diffuser design all in either single or twin lamp versions. You'll want more information about Sielect fittings because they meet such a wide variety of commercial, industrial—and even domestic—needs, so send now for our folder PD11/F33.

Following the reorganisation of the A.E.I. Group these products continue to be sold from former Siemens Edison Swan offices throughout the country. Our staff are unchanged and your enquiries and orders will be welcomed.

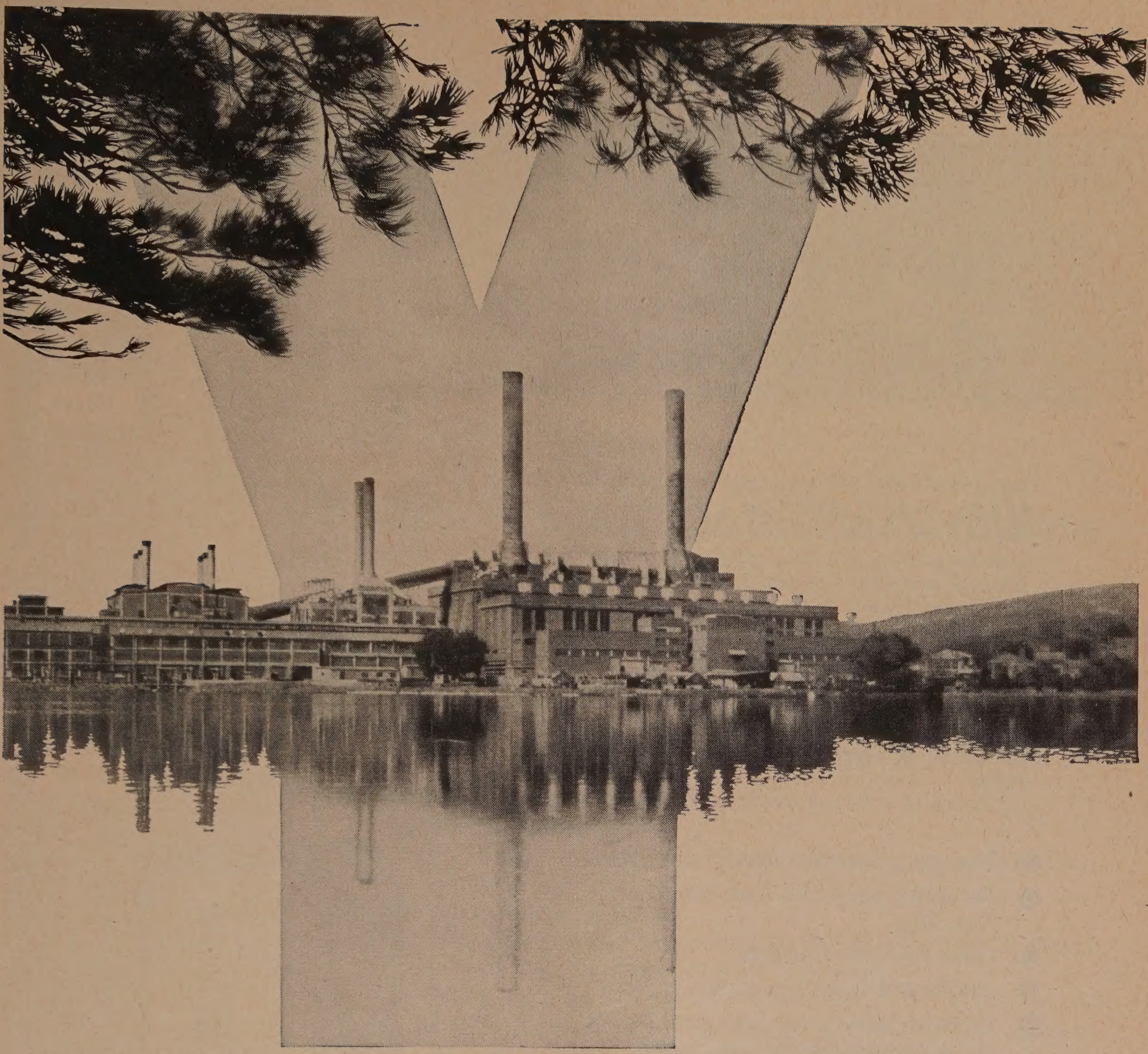
SIEMENS EDISWAN

LAMPS AND LIGHTING

38/39 Upper Thames Street, London, E.C.4



CRC 11/71



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18 YARROW BOILERS
installed at Pretoria 'A & B'
Power Stations

NOW

2-550,000 lb per hour
950 lb per sq. inch

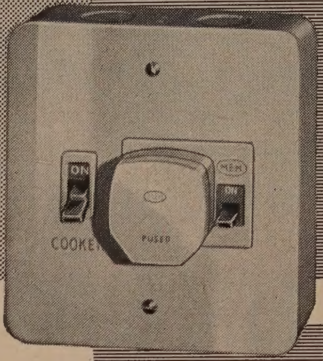
915°F pulverised fuel fired
YARROW boilers ordered by
Pretoria City Council for
the new power station at

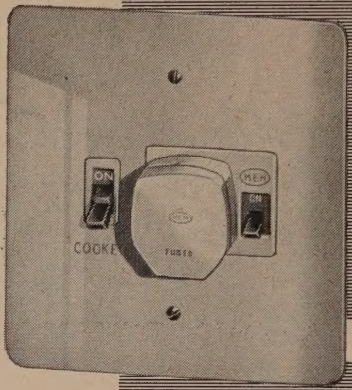
ROOIWAL

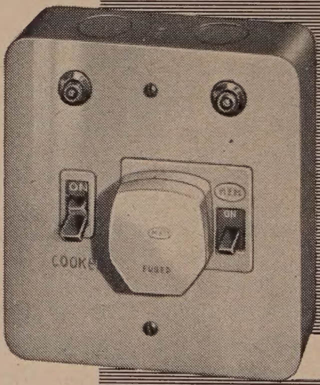
YARROW AND CO. LTD. SCOTSTOUN · GLASGOW · W.4

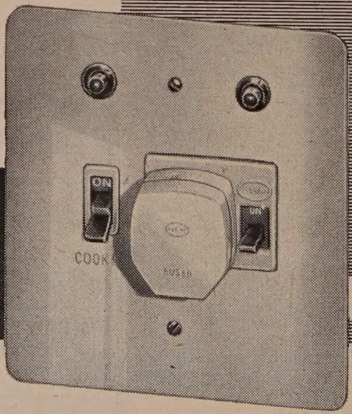
YARROW AFRICA (PTY) LTD · PO BOX 619 · JOHANNESBURG · SOUTH AFRICA

Control Units for the modern electric cooker


130 CCS


130 CCF


130 CPS


130 CPF

Rated at 30 amps, 250 volts, single phase A.C. only, the M.E.M. Cooker Control Unit is the ideal electricity control for the modern electric cooker, and provides for interchangeability of units as called for by B.S.1833.
The unit comprises a 30 amp 250 volt D.P. (A.C. only) switch for control of cooker, and an independent auxiliary circuit which includes a 13 amp 3 pin (flat) socket outlet with D.P. switch and complete with 13 amp moulded ivory fused plug.
Flush and Surface patterns are available in sheet steel enclosure, rust proofed, and finished in stove enamel ivory. Models can be supplied with or without two neon pilot lights.

- *One-piece interior simplifies wiring.*
- *Porcelain one-piece base eliminates "tracking".*
- *Good earthing facilities.*
- *Ample provision for conduit entries.*
- *Interior adjustment to correct any mis-alignment during installation.*
- *Clear semaphore indicators.*
- *Pilot lights clearly seen at all angles.*

MEM

Cooker Control units

Write for illustrated list No. 437R

MIDLAND ELECTRIC MANUFACTURING CO. LTD.,
TYSELEY, BIRMINGHAM 11

For testing and measurement

essential to so many

industrial processes and problems

AEI electronic instruments

THE FOLLOWING INSTRUMENTS ARE IMMEDIATELY AVAILABLE FROM STOCK.

- LEAK DETECTORS
  For detection of leaks in refrigerator systems, tanks, pipes.
- GAUSSMETERS
  For measuring flux density in instrument magnets, loudspeakers, d.c. relays.
- FREQUENCY METERS
  For measuring frequency of electric signals and speeds of shafts, reciprocating machinery, and machine tools.
- INFRA-RED RADIATION PYROMETERS
  For measuring temperature, without physical contact, of metal strip, bars, ingots.
- BALANCING EQUIPMENT
  For dynamic balancing of rotating machines in their own bearings on site.
- VIBRATION MEASURING EQUIPMENT
  For detection of vibration in rotating machinery and diagnosis of its cause.

Please write for technical information and a copy of our brochure 'Electronics in Industry'. State your testing problems and our Engineers will be glad to advise you. For immediate delivery of instruments phone Glenfield 531

AEI

Associated Electrical Industries Limited
Electronic Apparatus Division
NEW PARKS, LEICESTER, ENGLAND

A5384

VOLTAGE CONTROL

Expamet-Cressall resistors, rheostats and heaters form the most comprehensive range available from a single source and units to control loads from 4 watts to over 20,000 Kilowatts have already been supplied. The introduction of new designs of associated equipment widens still further the enormous field of applications of Expamet-Cressall products. Further details and technical advice from our engineers is freely available.

EXPAMET and CRESSALL
go together all the way

Expamet Cressall

The Electrical Division of The Expanded Metal Company Ltd.

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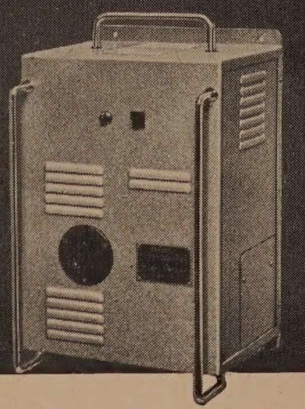
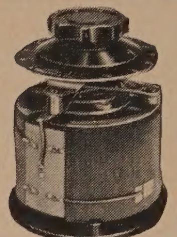
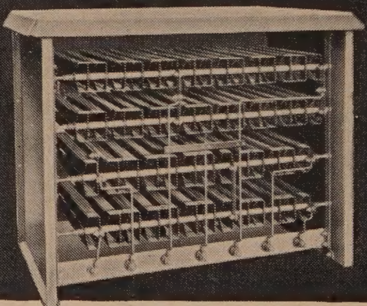
Works: Stranton Works, West Hartlepool
Telephone: Hartlepools 5531
The Cressall Manufacturing Company Ltd.
Eclipse Works, Tower St. Birmingham, 19
Telephone: Aston Cross 2666



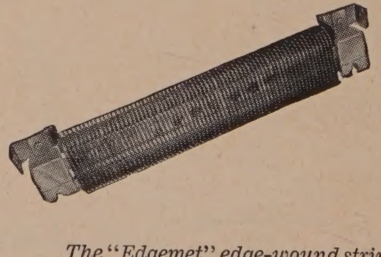
A range of A.C. Mains Voltage Stabilisers has been developed which incorporate electronic detector systems of new design, and are robust, reliable and very compact.



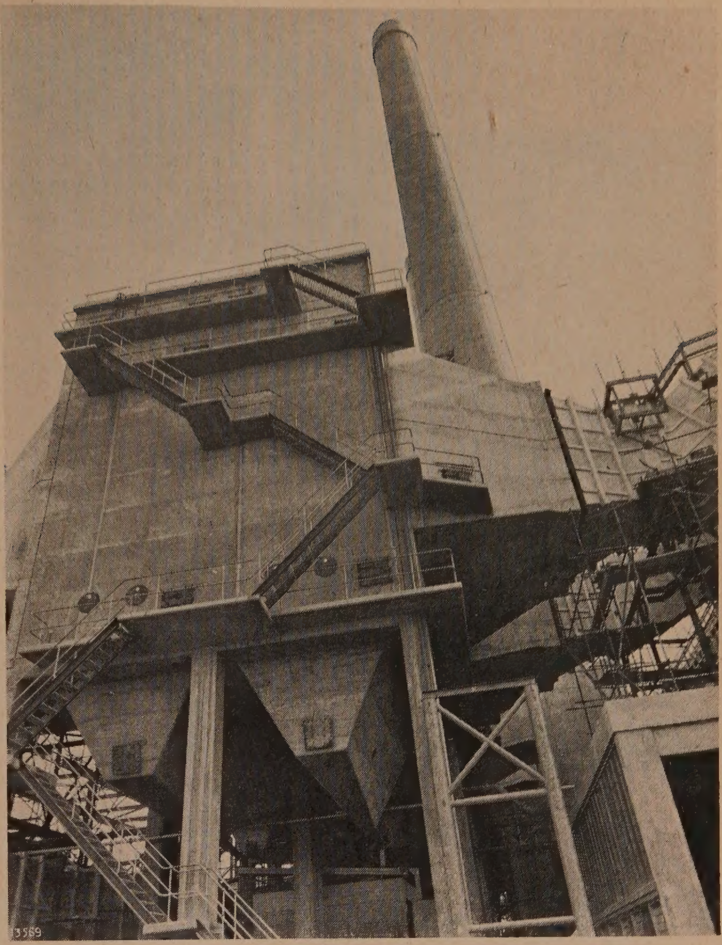
Torovolts are new toroidally wound continuously variable auto-transformers. Electrical and mechanical improvements give greater safety and reliability. Legible dials give maximum convenience in use.



"Expamet" expanded metal resistors are able to dissipate heavy electrical loads efficiently through long continuous service.



The "Edgemet" edge-wound strip type resistor for confined space and high temperature conditions.



"Excellent! There's another Sturtevant Electrostatic Precipitator being installed to stop grit emission"

STURTEVANT

ELECTROSTATIC PRECIPITATORS

are the most efficient and economical means of preventing grit emission

Our illustration shows one of the twelve Sturtevant Electrostatic Precipitators being installed at the Central Electricity Generating Board's new power station at Northfleet. Hundreds of Sturtevant Precipitators are operating at power stations in this country and abroad.

For particulars of Sturtevant Electrostatic Precipitators write for our publication U7009.

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CLEAN AIR

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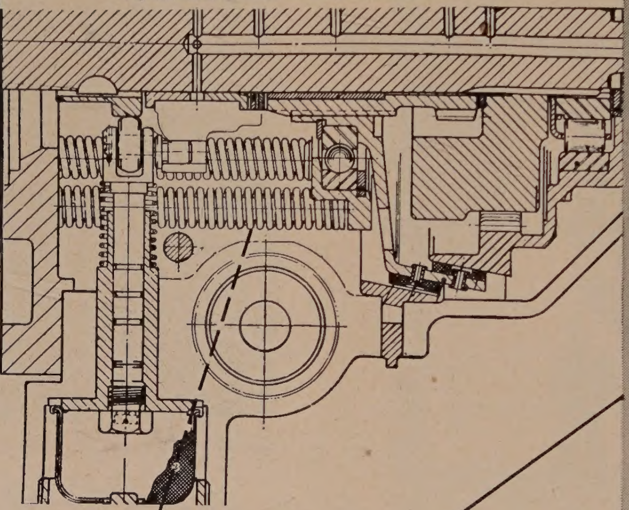
AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD., 400 SUSSEX STREET, SYDNEY, N.S.W.

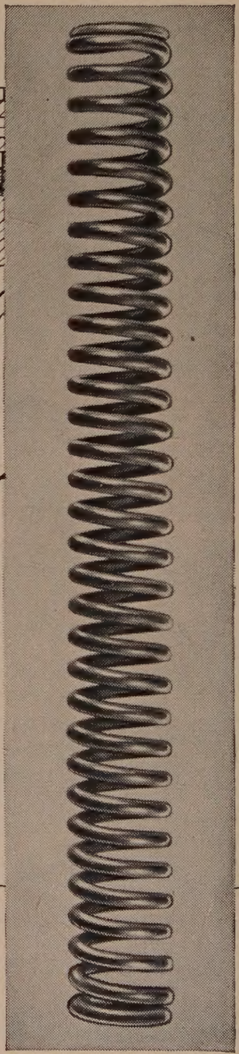
Vital links in controlled movement

A body needs muscles to control movement in very much the same way as a mechanism needs springs. These vital links take the stress and strain of every day rigorous use — nature provides the muscles SALTER provides the springs.

Two centuries of experience and development in the manufacture of springs of every type have enabled us to keep ahead of the ever-changing requirements of industry.



By courtesy of Laycock Engineering Ltd.



For springs with
the highest reputation
and top performance
specify SALTER
all-action springs.

The applications for
SALTER springs are wide and
varied — from heavy machinery
to finely balanced instruments.

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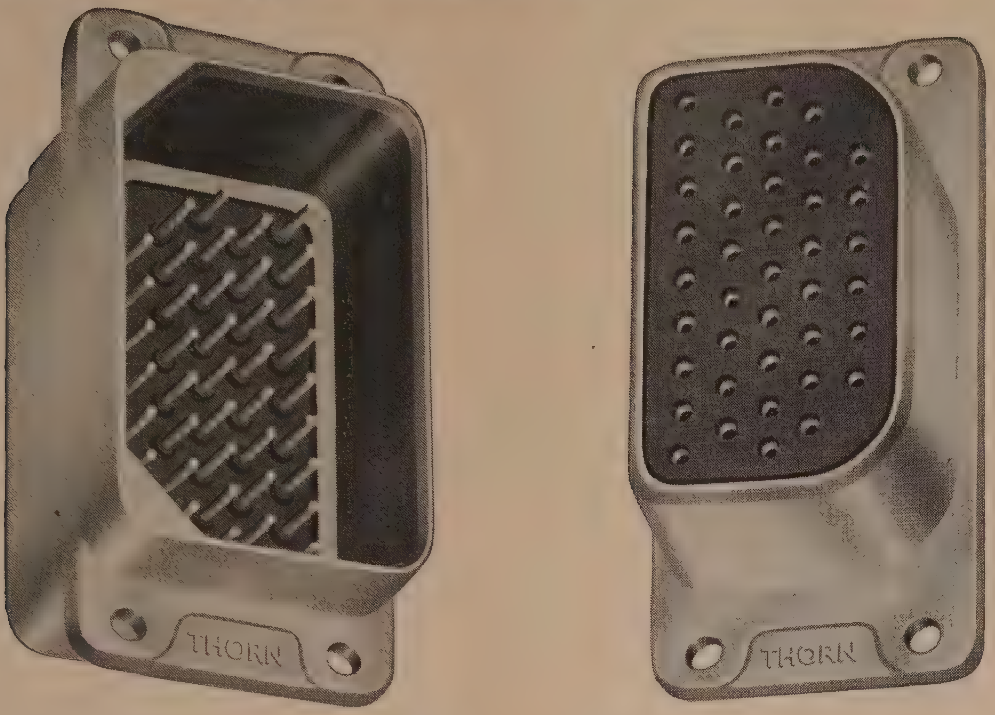
simpler...



stronger

Thorn "SR" connectors

.... the perfect external connector for racked components in console equipment

Rugged, simple construction is the outstanding feature of Thorn S.R. Connectors. The one piece, die-cast, cadmium plated shells and one piece resilient inserts of both plug and receptacle ensure exceptional resistance to shock and vibration.

Low engagement and separating forces are provided by the pliancy of the insert and the self centring action of the pins to the closed entry sockets.

* *Resistant to vibration, shock, corrosion and probe damage.*

* *Operate over the temperature range* −40°C *to* +100°C.

* *One piece die-cast, cadmium plated shells—one piece resilient inserts.*

* *Closed entry sockets—Self centring pins.*

* 40 *pins (as illustrated).*

* *Pin rating:* 4 *amps.*

* *Operating voltage:* 250 *volts A.C.*

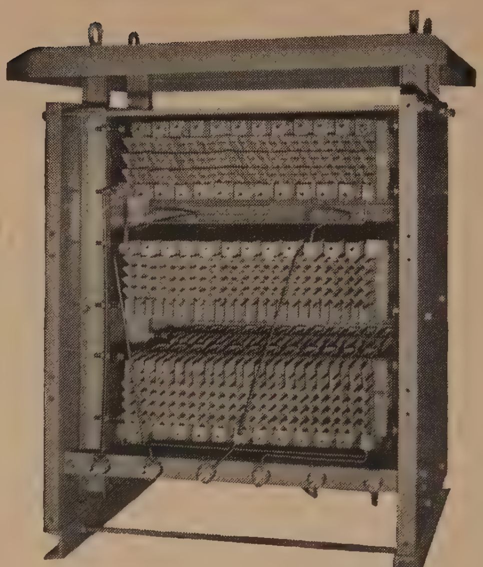
* *Overall dimensions:*
Plug 2.312″ x 1.125″ x 1.000″
Receptacle 2.312″ x 1.125″ x 1.125″

The complete AN Series and Pygmy PT series are also included in the Thorn ranges of Electrical Connectors.

Thorn

THORN ELECTRICAL INDUSTRIES LIMITED, AIRCRAFT COMPONENTS & CONNECTOR DIVISION
GREAT CAMBRIDGE ROAD, ENFIELD, MIDDLESEX. TELEPHONE: ENFIELD 5353

Let **Fawcett** carry the load . .



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ELECTRICAL ENGINEERS EXHIBITION

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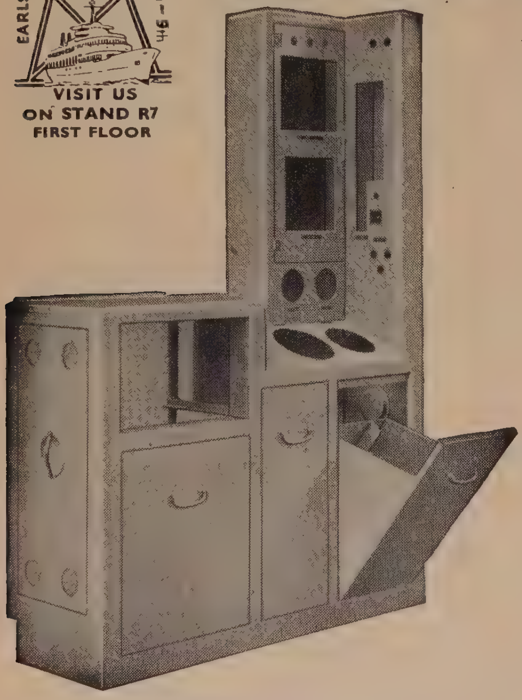
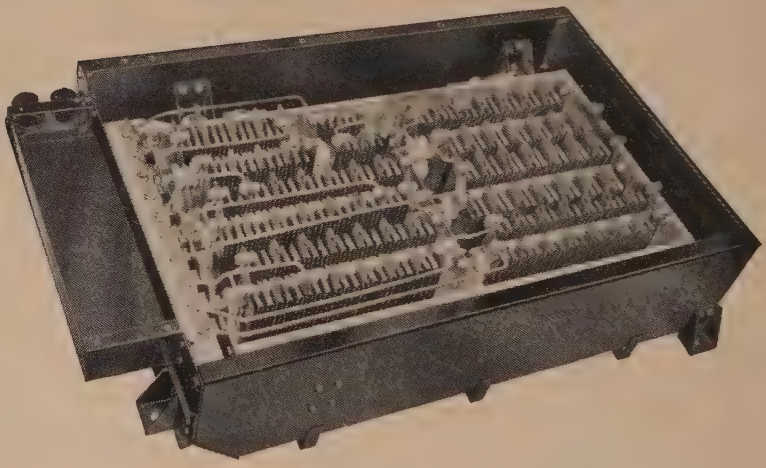
● F. P. SERVICE **RESISTORS**

Unbreakable. Rustless. Rigid. Weatherproof or open types built to any specific rating. Grids of top grade materials to suit ohmic values required. Spot welding of grids prevents non-homogeneous contact joints. Banks easily removed—no dismantling required. For Industrial, Traction, Power Station and Marine installation.



● **CUBICLES AND PANELS** FOR SWITCHGEAR AND INSTRUMENTS

Quality Switchgear and Instruments are best fitted in Fawcett Cubicles, Panels and Control Desks — manufactured to your own specification or expertly designed to your particular requirements. High quality materials and stove enamel finish with latest equipment.



● F. P. HIGH-TEMP. **RESISTORS**

Designed to operate at high temperatures. High overload capacity. No local hot spots. Safe operation. Minimum space and weight. Unbreakable. For Traction, Industrial and Marine installation.

Please quote Ref. No. 162/N in your enquiries

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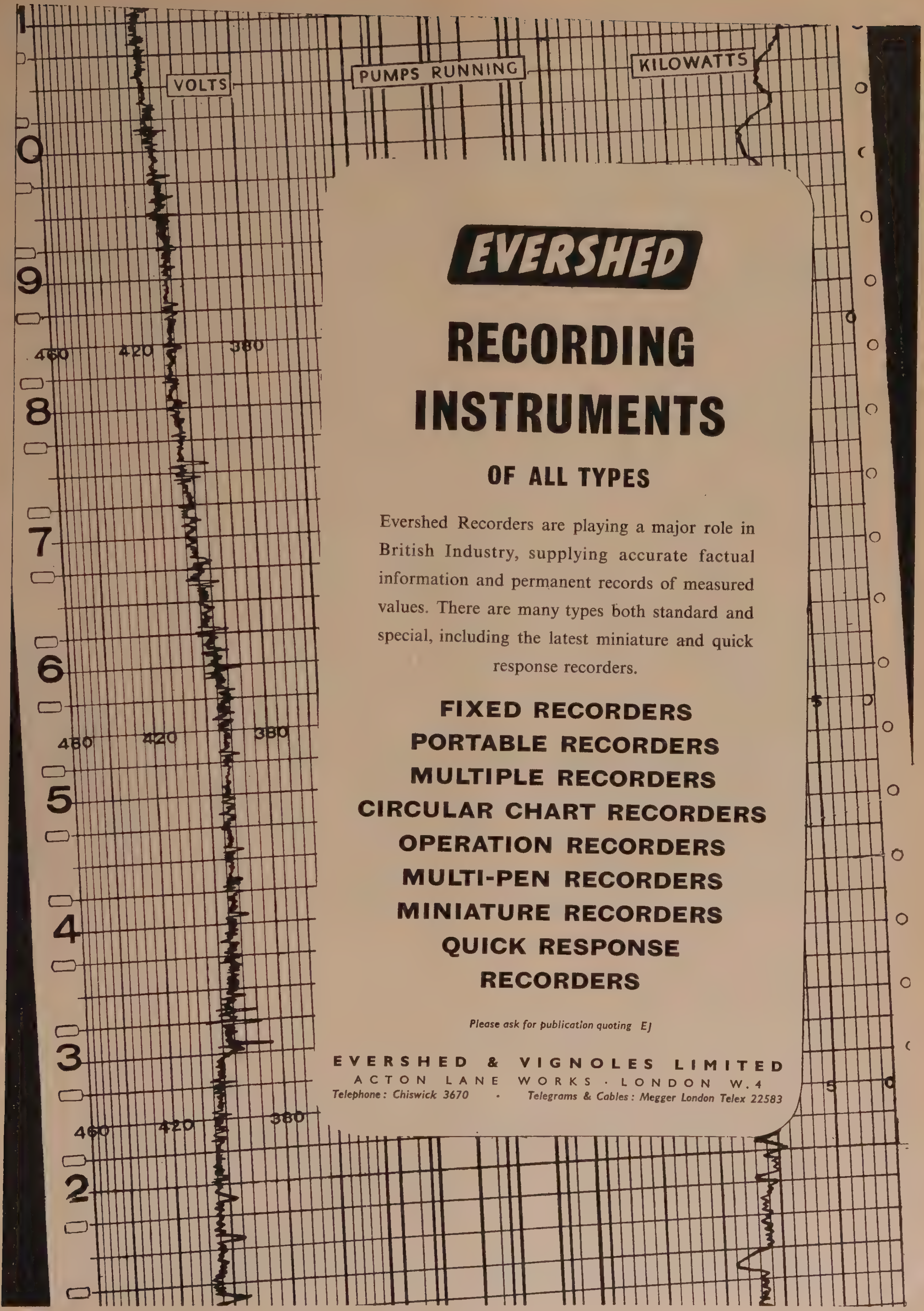

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OF ALL TYPES

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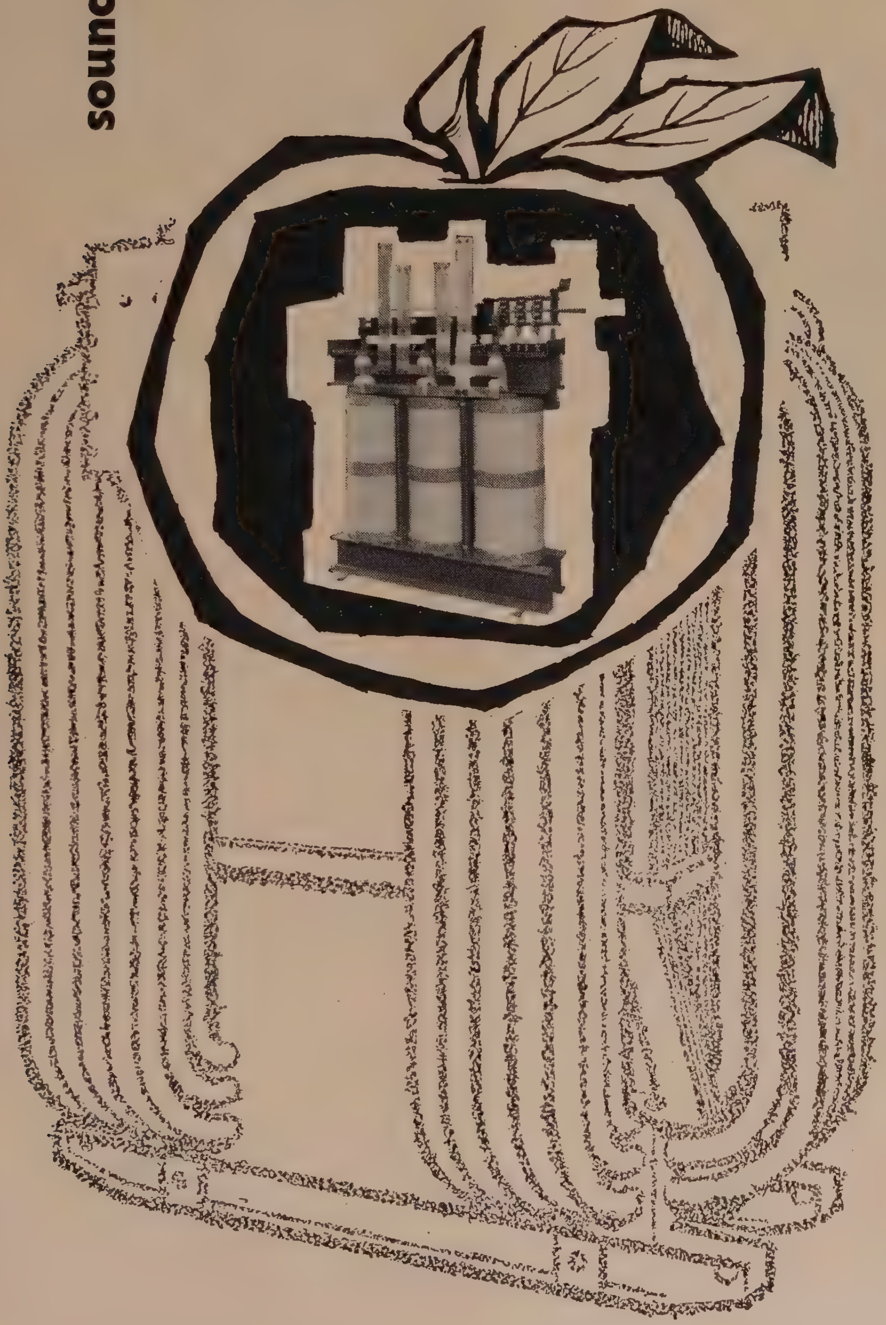
7/134

Strictly between ourselves Carruthers, these animated totems have got a touch of the old mass hysteria. It won't last, laddie—mass production stuff never does. Ask 'Snorty' Masters! He's in copper wire with those Symonds wallahs. Every inch of their wire, strip, and strand, is precision made. Bags of the old craftsmanship, what! Their stuff will still be on when sahib and chips is off.

Serious enquiries please to **R. H. SYMONDS LTD.** *47 Victoria St., S.W.1. Tel: Abbey 2771/5*

sound to the core

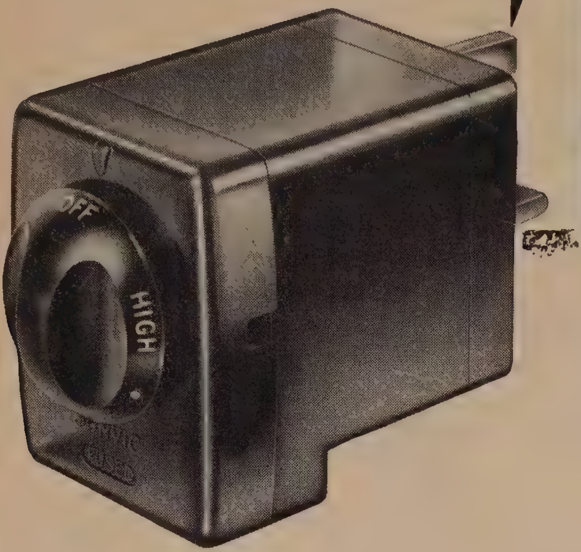
On the surface one transformer may look much like another. It is the quality of workmanship that makes these Lindley Thompson 750 kVA units so outstandingly reliable. Sound design, patient hand-craftsmanship and stringent testing during and after assembly are still the order of the day at Lindley Thompson—and always will be!



LINDLEY THOMPSON TRANSFORMER & SERVICE CO. LTD.

ST. MARY'S ROAD, LANGLEY, SLOUGH, BUCKS.

this is happening everywhere!



Special offer!

Initial orders for 12 and more will be supplied in this attractive display carton

Yes, everywhere people are buying a "Reguplug"! Housewives, householders, handymen—they are all pleased with this good idea which Sunvic call the "Reguplug". When customers see the "Reguplug" displayed—*they buy!* For here at last is a handy little device for controlling heat output of numerous electrical appliances. The "Reguplug" enables people, quite simply, to regulate an appliance to give just the heat required. Saves switching on and off—*saves electricity!* Ideal for heated carpet underlay, airing and drying cabinets, percolators, kettles, electric blankets, soldering irons, glue pots, heating platens, urns, wash boilers, sterilising equipment, and any electrical heating appliance.

Retail Prices

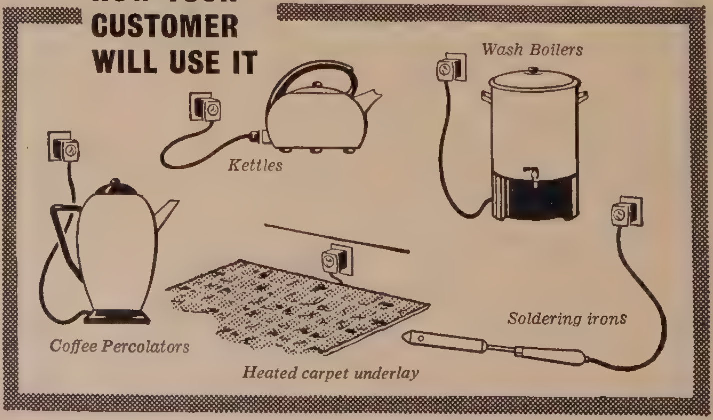
REGUPLUG
15 amp round pin . . . **35/-**

REGUPLUG
13 amp
flat pin (fused) **37/6**

WHAT IS THE "REGUPLUG"?

The "Reguplug" is the "Simmerstat" designed to fit directly into a three-pin socket. It provides any piece of electrical heating apparatus with continuously variable control from off to full. Definite dwells are provided in the OFF and HIGH positions. Moulding is of high quality bakelite, white or brown. Silver contacts. For 13 amp and 15 amp circuits, 230/240V A.C., complying with BSS 1363 and BSS 546 respectively.

HOW YOUR CUSTOMER WILL USE IT

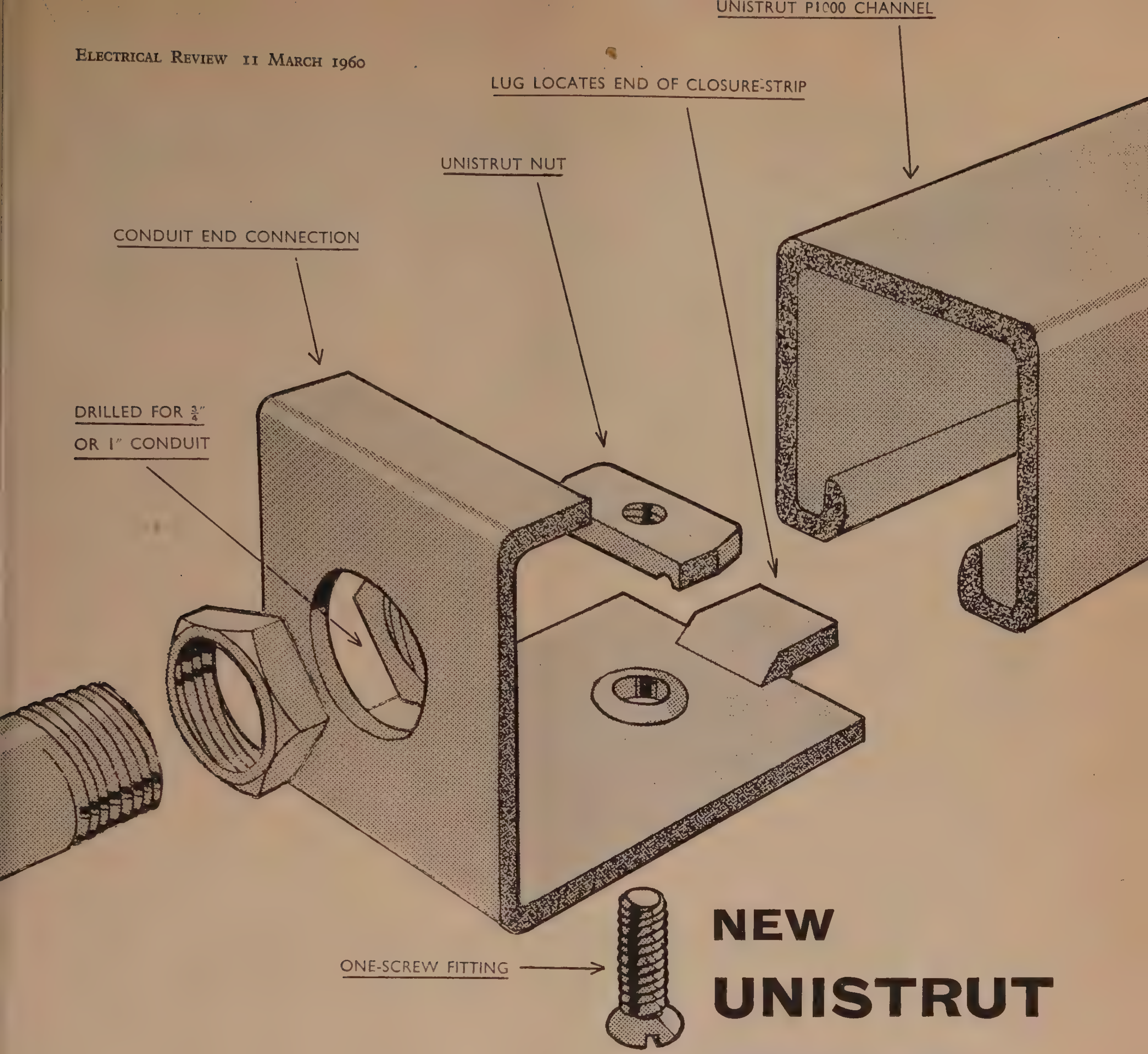


The Sunvic "Reguplug" is a product of:

AEI

Instrumentation Division
P.O. Box 1 Harlow Essex Harlow 25271
Associated Electrical Industries Limited

SC/93A



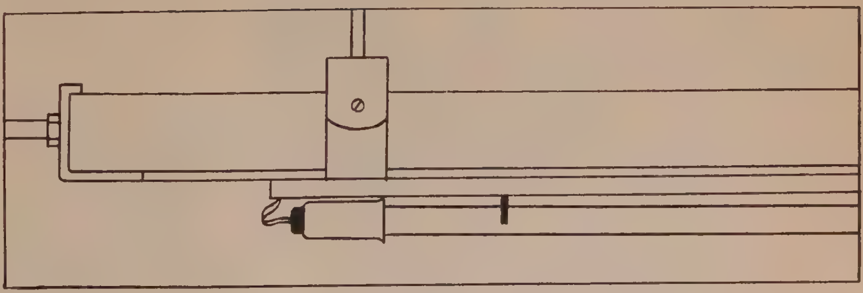
NEW UNISTRUT CONDUIT END CONNECTIONS

SPEEDS FLUORESCENT INSTALLATION

This new component neatly and quickly effects the change-over from conduit to Unistrut channel where the latter is used as fluorescent lighting trunking. It is secured by a single screw to a self-locating nut in the channel, and is supplied ready drilled for either 1″ or ¾″ conduit.

The connection may be used either where the individual fluorescent fittings are secured direct to the Unistrut channel, or where the channel is clamped to high roof-beams, etc. with the individual fittings on droppers. In either case, wiring accommodated in the channel is neatly concealed by a snap-in closer strip.

The Unistrut conduit end connection is available in Unistrut green stove enamel finish or electro-plated. Please write for drawings to include in your Unistrut Parts Catalogue.



For information on the Unistrut system in fluorescent lighting trunking and other electrical applications, please write to:–

A MEMBER OF THE GKN GROUP OF COMPANIES

UNISTRUT DIVISION OF SANKEY-SHELDON LTD.

43/45 Broadwater Road, Welwyn Garden City, Herts. *Tel: Welwyn Garden City 6321 (4 lines)*

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Lock

SMOKE METER
& ALARM WILL
WARN YOU

Simple to install, it gives continuous record of smoke density, sounding alarm automatically if smoke becomes excessive.

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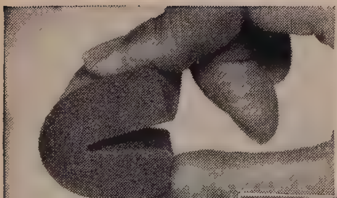
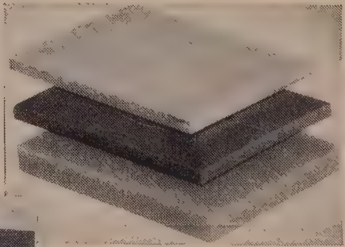
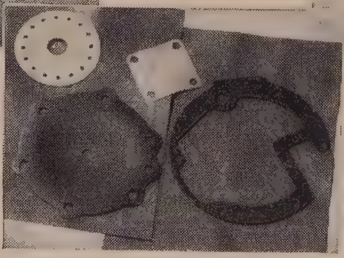
REGD.
SILICONE RUBBERS
The most comprehensive range available



▲ *A. Prescolastik Expanded Silicone Rubber*
Uses: Soft Gasketing, Vibration Damping, Seals, Pads and Dampers.

B. Prescolastik Silicone Rubber Sheet
Uses: Gaskets, Seals, Diaphragms, Washers, Etc.





◀ *C. Prescolastik Silicone Coated Fabrics*
Uses: Diaphragms, Gaskets, Seals, Tapes, Ductings and Flexible Low Temperature Coverings.

TAKE ADVANTAGE of the technical resources and production facilities of the most modern silicone rubber plant in the United Kingdom.

Prescolastik silicone rubbers offer the widest available range of compounds to meet the most exacting conditions.

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High Tensile Grades
High Temperature Grades
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Designers and Engineers are invited to write to us for technical data.

Specialists in precision rubber engineering

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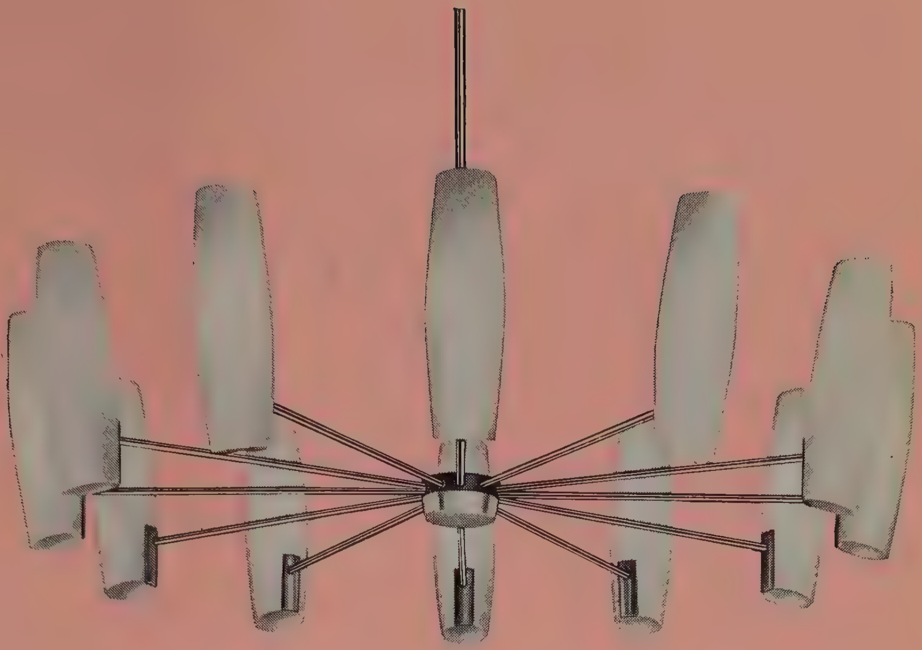

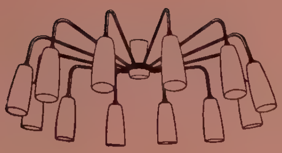

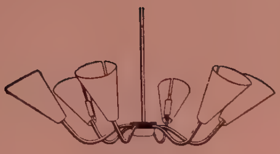

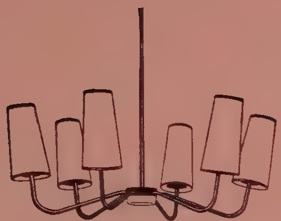

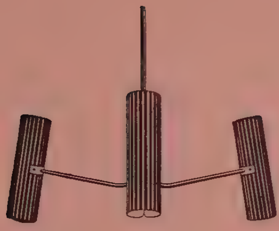

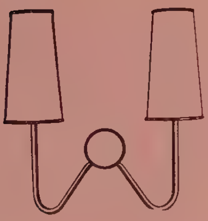

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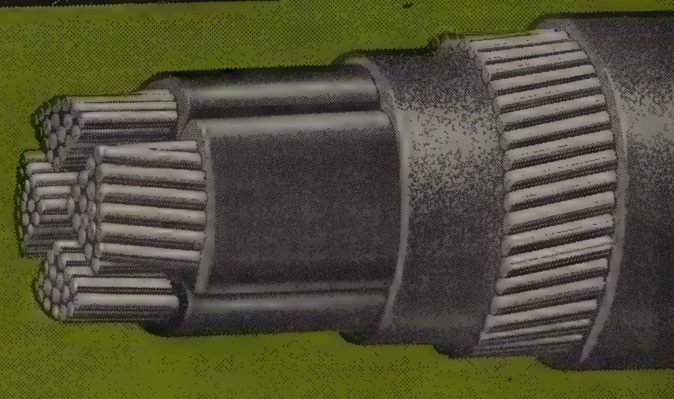

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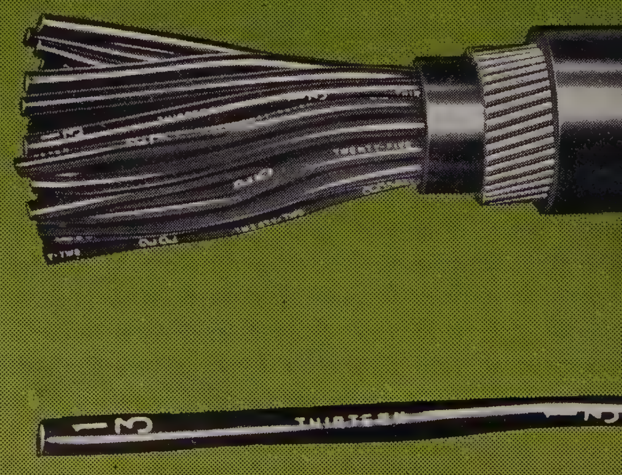

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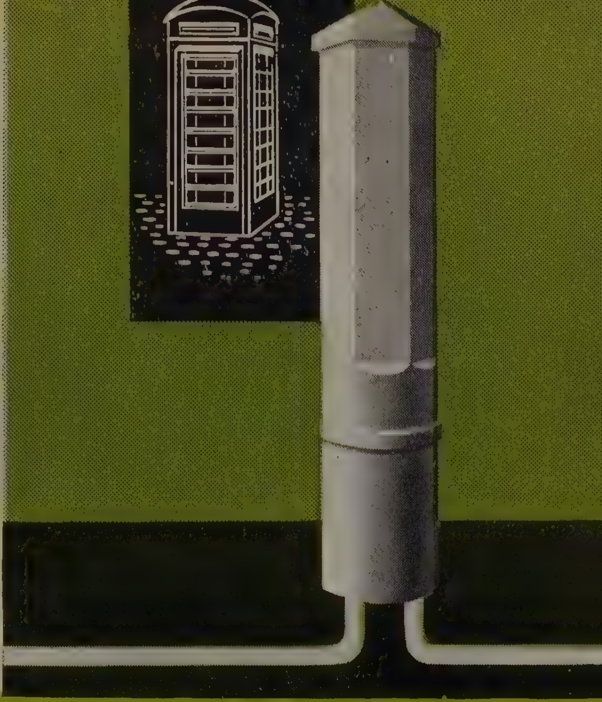

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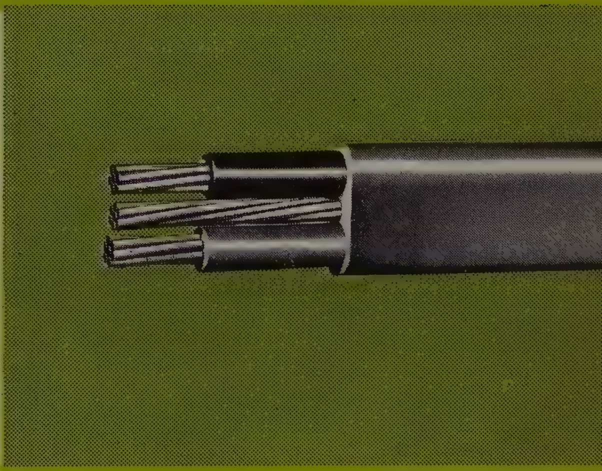

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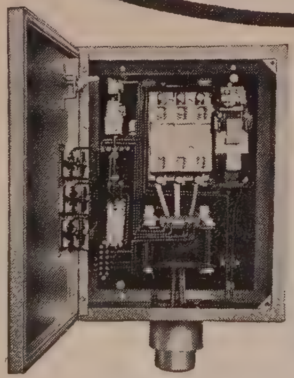

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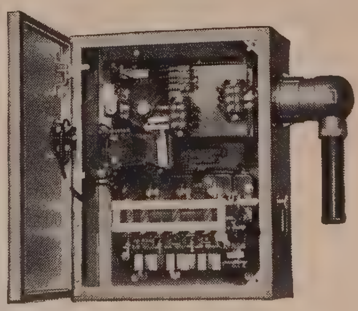

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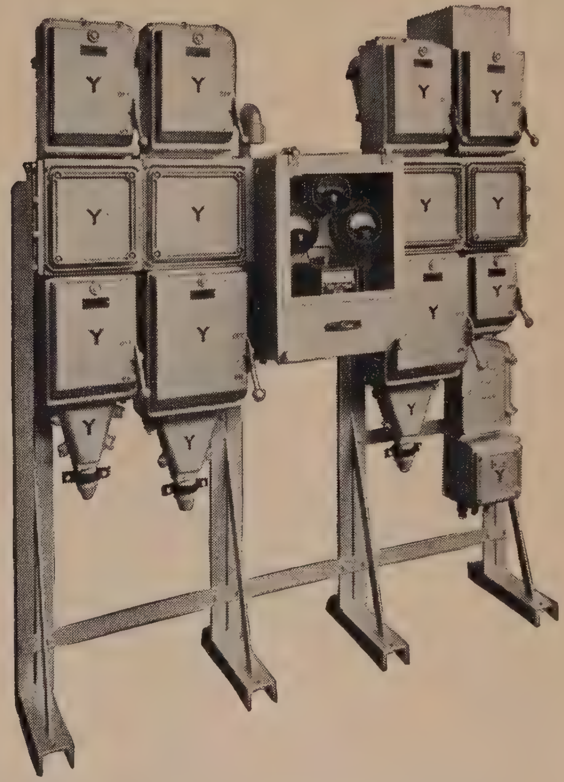

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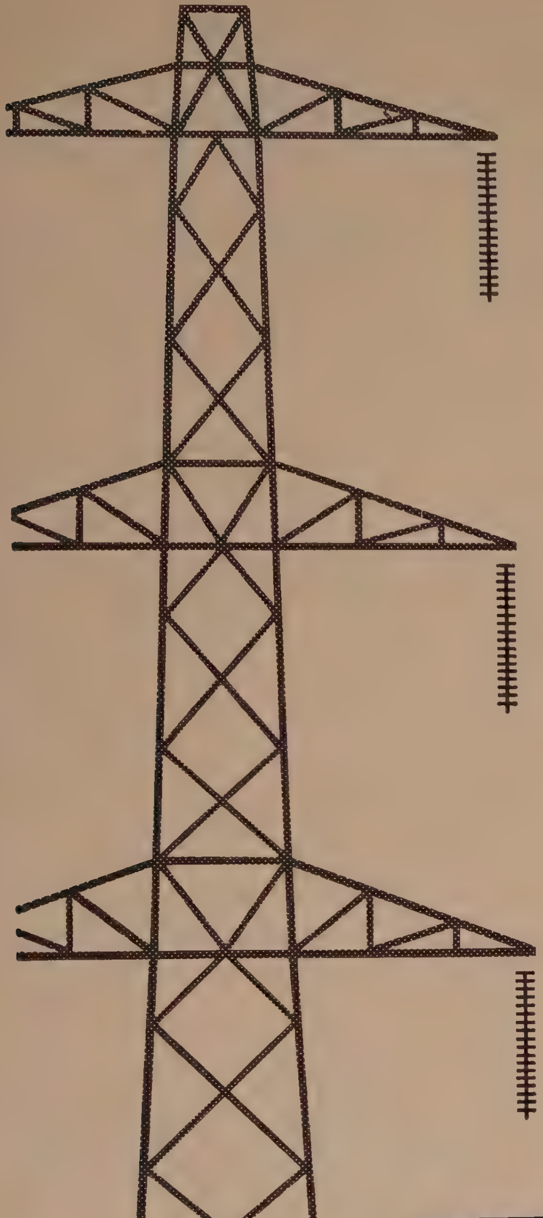

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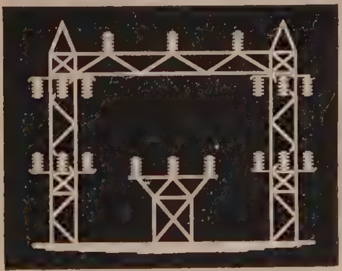

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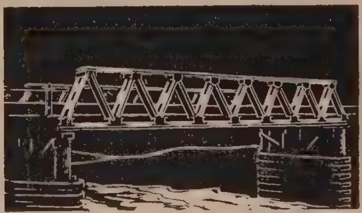

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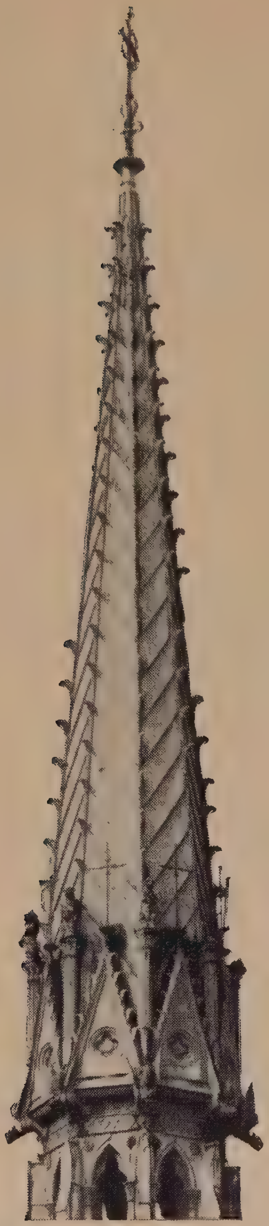

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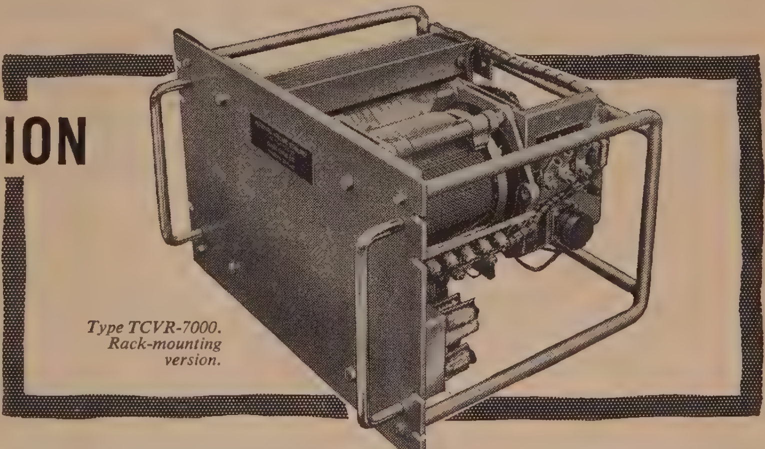

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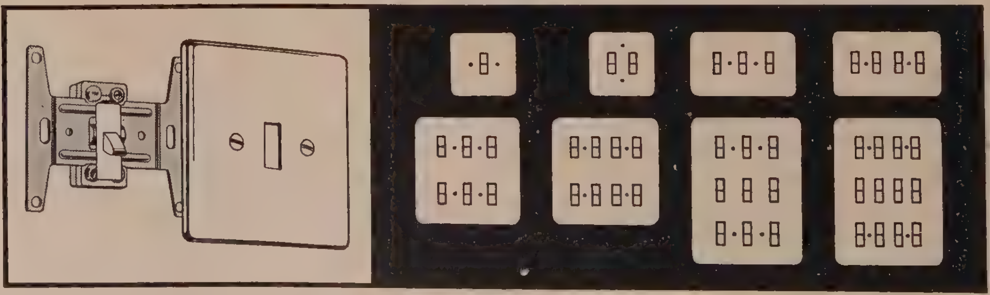

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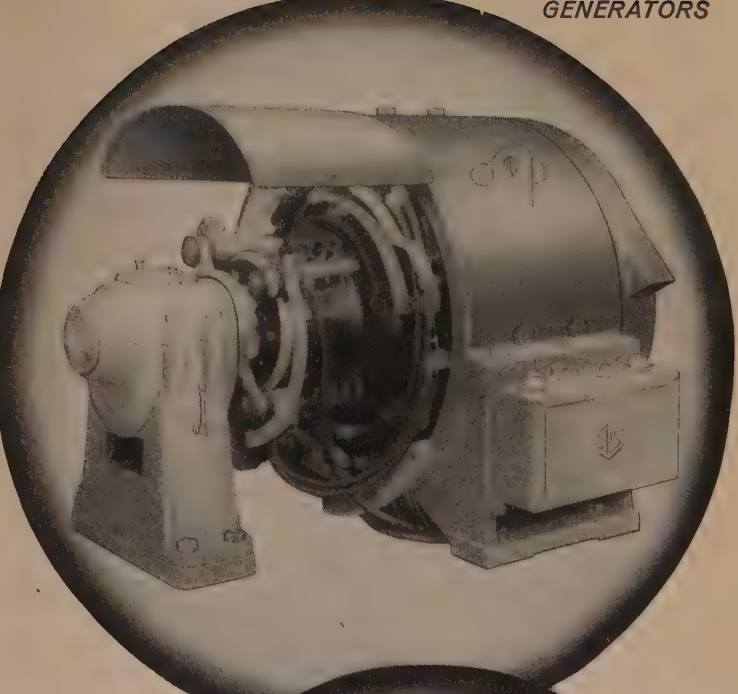

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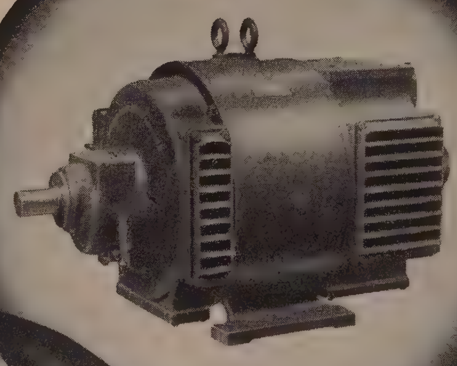

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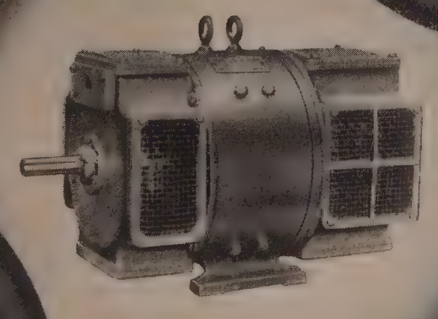

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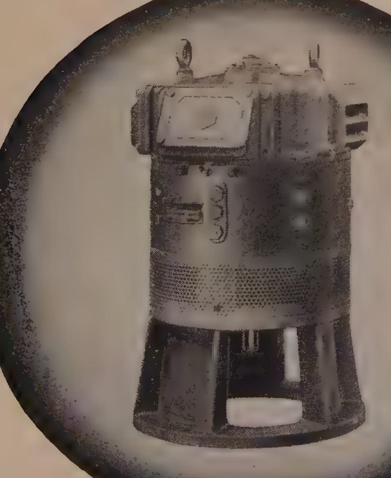

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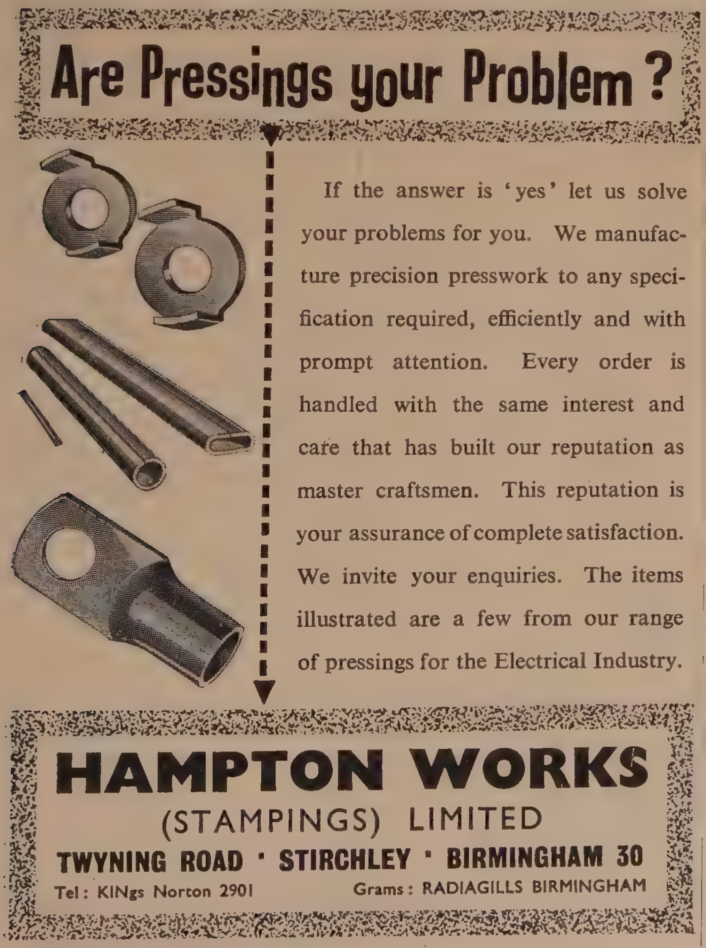

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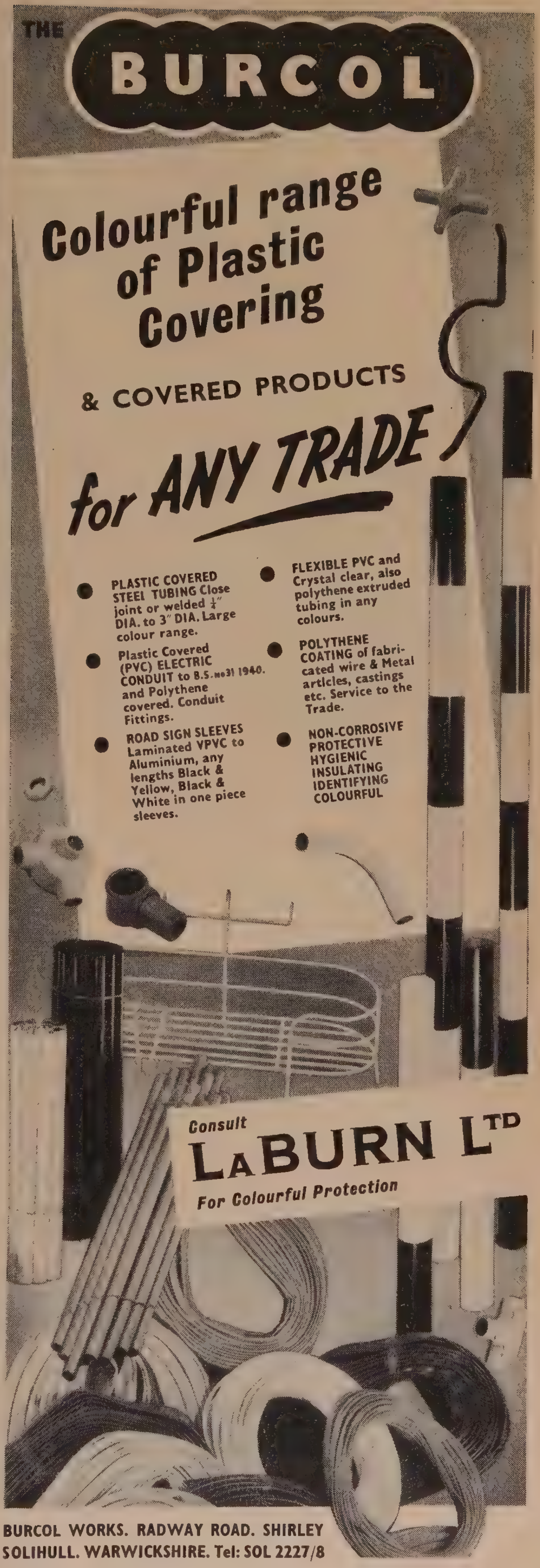

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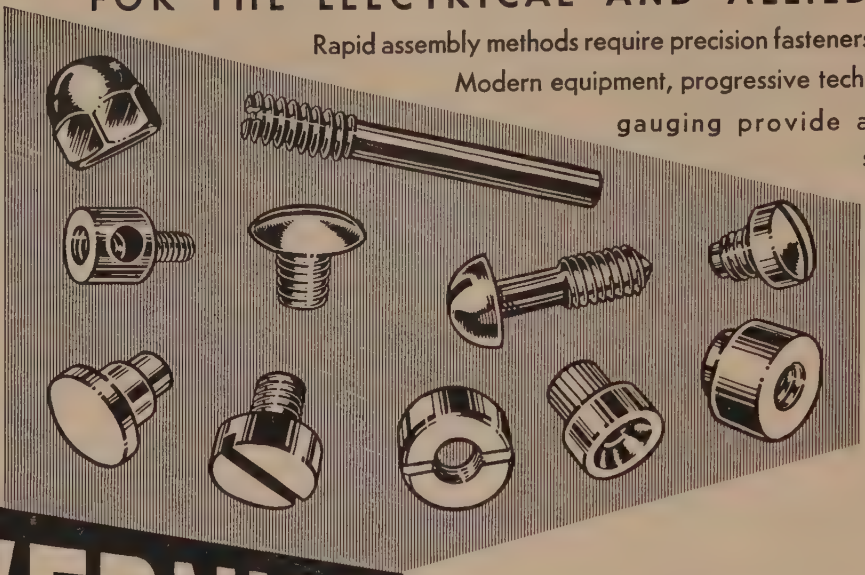

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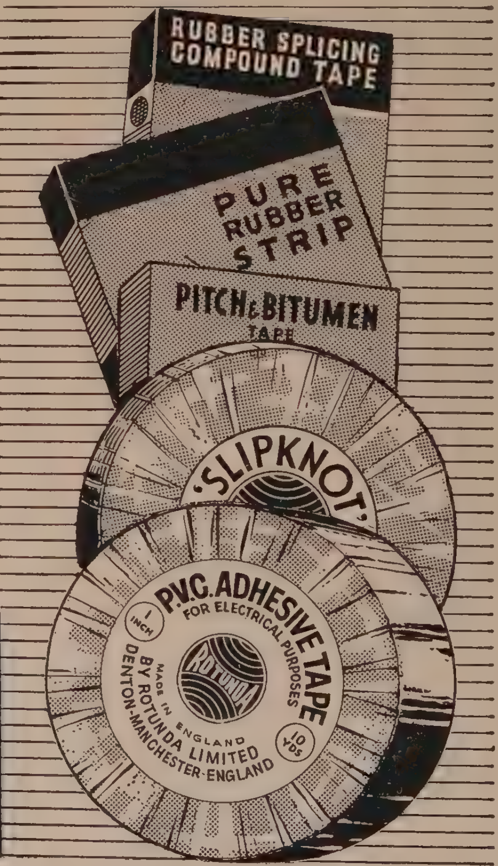
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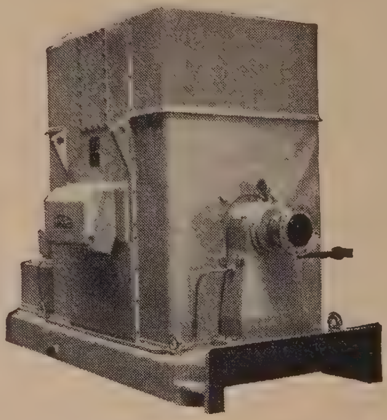

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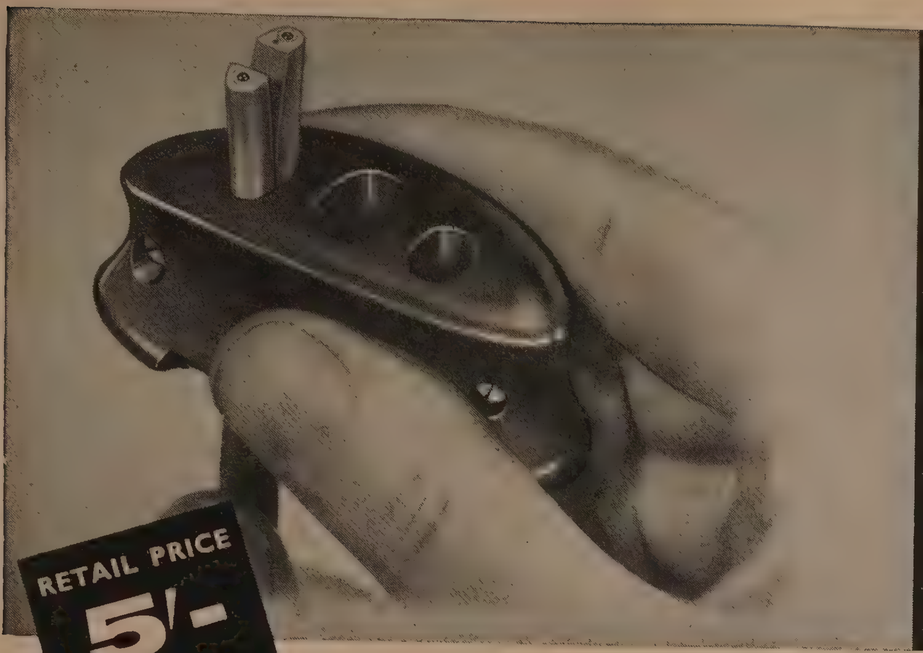

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FROM

Volex

ACCEPTED BY THE COUNCIL OF INDUSTRIAL DESIGN FOR "DESIGN INDEX"

CABLE STRIPPER

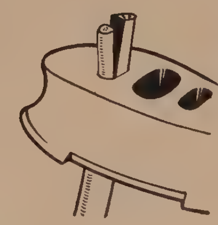
ONLY A FEW SECONDS TO STRIP P.V.C. SHEATHING—ACCURATELY

The Volex Cable Stripper has been received with great enthusiasm and wholesalers throughout the country are carrying stocks and meeting this ever-increasing demand.
A razor-sharp cutting blade is pre-set to ensure an accurate stripping of the Sheath. The single tool is designed to accommodate 3 sizes of P.I.P.V.C. Cable to B.S. 1557.

3/.029 Twin Flat.
3/.029 Twin with Earth.
7/.029 Twin with Earth.

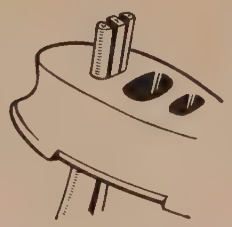
This stripper will be of inestimable value to every electrical wiring contractor and is available from your wholesaler.

1



Insert Cable into the appropriate aperture and force the stripper along the Cable to the desired length.

2



For Twin with Earth Cable the process must be repeated for each conductor.

- **SPEEDS UP WIRING INSTALLATIONS**
- **SMALL, COMPACT AND EASY TO HANDLE**
- **CONVENIENTLY PRICED**

FOR POLYTHENE INSULATED
P.V.C. SHEATHED CABLES
to B.S.1557 only

EVERY WIREMAN NEEDS A VOLEX CABLE STRIPPER

VOLEX ELECTRICAL PRODUCTS LTD.
SALFORD 6.

Telephone: PENDLETON 4373

Telegrams: "VOLEXPROD," Salford 6

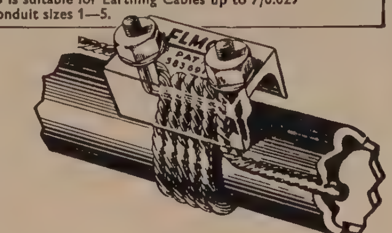
"ELMO"

EARTHING CLAMPS

A COMPLETE RANGE TO B.S.951. 1948 IN 4 SIZES

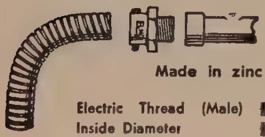
IN 4 SIZES	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes i.e. in trade terms	1, 2 & 3 ½" to ¾"	4 & 5 1" and 1¼"	6 & 7 1½" and 2"	8, 9 & 10 2½" to 3½"

NOTE ALSO: Type A123 is suitable for Earthing Cables up to 7/0.029" and for B.S. conduit sizes 1—5.



"Elmo" Earthing Clamps are of robust construction Impossible for wire to pull out, always under tension, therefore a most satisfactory earth and a permanent safeguard.

ELECTRICAL FITTINGS

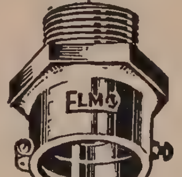


Flexible-to-rigid CONDUIT COUPLINGS

Made in zinc base alloy in the following sizes:

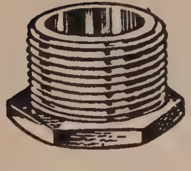
Electric Thread (Male)	⅝"	¾"	1"	1¼"	1½"	2"
Inside Diameter	⅝"	¾"	1"	1¼"	1½"	2"

Electric Thread (Male)	⅝"	¾"	1"	1¼"
Inside Diameter Flexible Conduit	½"	⅝"	¾"	1"



WITH EARTHING TERMINAL

Special Features: Integral Earthing Terminal, tinned ready for soldering. Fixing screw for continuity. Internal Threads suit all makes of flexible tubing.



MALE
Hex. Section

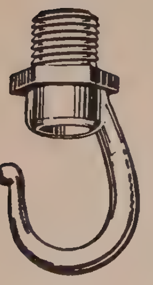
CONDUIT BUSHES

Made in the following sizes:

MALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"

FEMALE: Electric Thread
⅝" ¾" 1" 1¼" 1½" 2"

FEMALE
Flat Face Section for Spanner (except ⅝" size, which is round)



CONDUIT HOOK

For fluorescent lamps and overhead lighting fittings. Screwed ¾" thread, male electric.

CEILING PLATE

One hook

Made to fit all standard boxes with two holes 7/32" diameter —2" centres diametrically opposed. Designed in accordance with British Standard Specification.

Both made in aluminium alloy

Manufactured by M. MOLE & SON LTD.
BIRMINGHAM · 3 · ENGLAND Est. 1835

SAFETY is OTTER'S business for SAFETY'S sake fit Otter REGD. THERMOSTATS AND SAFETY CUT-OUTS

Otter Motorguard
Type H.MK.11

The simplest and safest of all

WORLD PATENTS INCLUDING PATENT NUMBERS 600055, 622781
624905, 657434, 713443, 749716, 774911, 782668 AND OTHERS.
ALSO OTHER PATENTS PENDING.

OTTER CONTROLS LIMITED
OTTERS 'OLE, BUXTON, DERBYSHIRE
Phone Buxton 650 (2 lines)

0/1b

CUT HERE

IMMEDIATELY
AVAILABLE
FROM STOCK
THE NEW
SQUIRREL CAGE
MOTORS

(with class 'E' insulation)

- Comply with Draft B.S. —A (ELE) 1629.
- Continuously maximum rated to B.S. 2613 for a temperature rise of 65°C in a normal ambient (max. 40°C).
- Totally-enclosed, fan-cooled 'D' frames.
- Interchangeable with ventilated machines, ('C' frames) of the same ratings (B.S. 2960).
- Available from stock in outputs up to 7½ h.p., 1500 r.p.m., and 5 h.p., 1500 r.p.m. Higher ratings up to 40 h.p. will be available shortly.

348

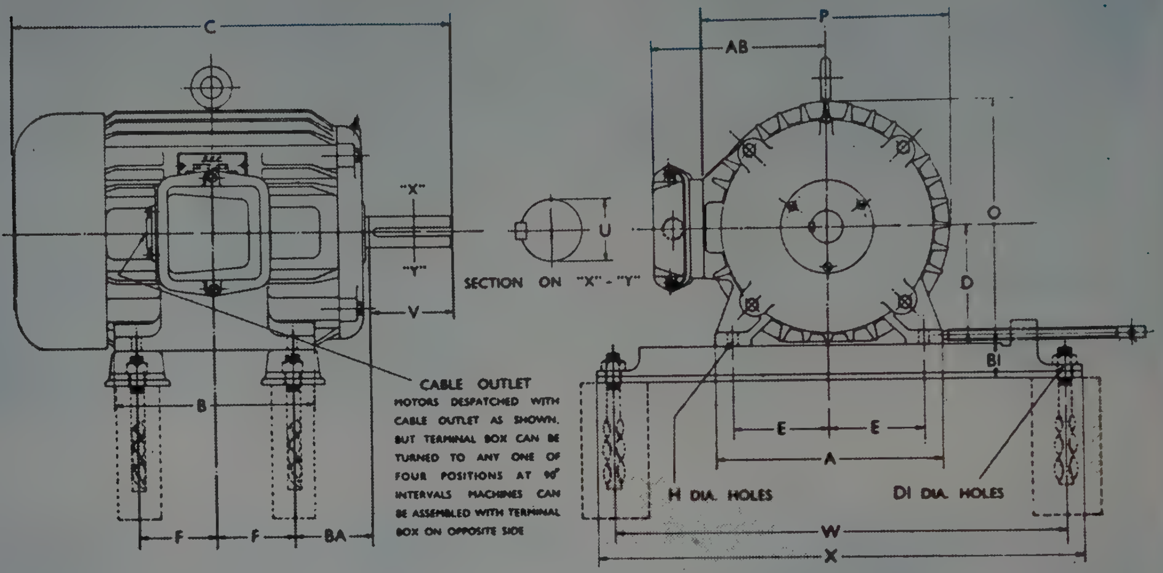
BY G.E.C.

FOR RATINGS AND DIMENSIONS SEE OVERLEAF ▶

The new squirrel cage motors

(with class 'E' insulation)

RATINGS AND DIMENSIONS



CABLE OUTLET MOTORS DESPATCHED WITH CABLE OUTLET AS SHOWN, BUT TERMINAL BOX CAN BE TURNED TO ANY ONE OF FOUR POSITIONS AT 90° INTERVALS MACHINES CAN BE ASSEMBLED WITH TERMINAL BOX ON OPPOSITE SIDE

H.P.		Frame Size	Frame											Shaft Extension		Slide Rails			
1,500 r.p.m.	1,000 r.p.m.		A	AB	B	BA	C	D	E	F	H	O	P	U	V	W	X	BI	DI
1	1/2	D162	8	6 1/2	5 1/4	2 3/4	13 5/16	4	3 3/8	2	3/8	8 1/16	8 1/8	·7500	2 1/4	20 3/32	21 31/32	1 9/16	3/4
1 1/2	3/4	D164	8	6 1/2	6 1/4	2 3/4	14 1/4	4	3 3/8	2 1/2	3/8	8 1/16	8 1/8	·7500	2 1/4	20 3/32	21 31/32	1 9/16	3/4
2	1	D182	9	7 1/16	6	2 3/4	14 3/4	4 1/2	3 3/4	2 1/4	7/16	9 1/16	9 1/8	1·1250	3	20 3/32	21 31/32	1 9/16	3/4
3	2	D184	9	7 1/16	7	2 3/4	15 3/4	4 1/2	3 3/4	2 3/4	7/16	9 1/16	9 1/8	1·1250	3	20 3/32	21 31/32	1 9/16	3/4
5	3	D213	10 1/8	7 5/8	7 1/2	3 1/2	18 9/32	5 1/4	4 1/4	2 3/4	7/16	10 3/4	11 1/32	1·3750	3 3/4	20 3/32	21 31/32	1 9/16	3/4
7 1/2	5	D215	10 1/8	7 5/8	9	3 1/2	19 3/4	5 1/4	4 1/4	3 1/2	7/16	10 3/4	11 1/32	1·3750	3 3/4	20 3/32	21 31/32	1 9/16	3/4

G.E.C.

for further details, please write to:

THE GENERAL ELECTRIC CO. LTD. OF ENGLAND

ROTATING PLANT DIVISION, WITTON, BIRMINGHAM 6
Telephone: EASt 1941 Telex: 33-323
Telegrams & Cablegrams: 'Polyphase, Birmingham'

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NEWS FLASH

NOW ONLY £36.15.0 (TAX PAID)

Table top £1. 7. 3. extra *(Tax paid)* Legs 17/6d. extra

FOR THE JACKSON 202 REFRIGERATOR

2 CUBIC FEET

FAMILY SIZE

THESE FEATURES MAKE THE 202 A TOP SELLER—

- Heatproof table top
- Special Plastic Cabinet
- Surprisingly large storage space (just look what it holds)
- Big door storage space
- Silent unit
- Sturdy legs

THIS MEANS BIGGER SALES FOR YOU IN 1960

Increased sales and streamlined production have made it possible for us to offer the 202 at this new low price. Sales will be even greater than last year.

ORDER NOW

FOR CERTAIN DELIVERY AS YOU WANT IT

Last season we were swamped with orders for the 202, the demand was tremendous—orders for 1960 are coming in fast and we urge you to *place your order now* to avoid disappointing your customers.

Electrical Division of Radiation Ltd. 255 North Circular Road, London, N.W.10.

THERMOCOUPLE ALLOYS BY BRITISH DRIVER-HARRIS

We have been making thermocouple alloys at Cheadle for many years. Our experience tells us what people look for and our alloys provide it—stability, constant EMF values and long life.
Different temperature ranges call for different alloy combinations—and we provide them, including 'T1/T2', the only British-made base metal thermocouple for temperatures up to 1100°C. In cases where thermocouple wires are covered by a British Standard we produce them to conform to the Standard.
Accurate temperature measurement and control is something that cannot be left to chance. It is best left to Driver-Harris thermocouple alloys.

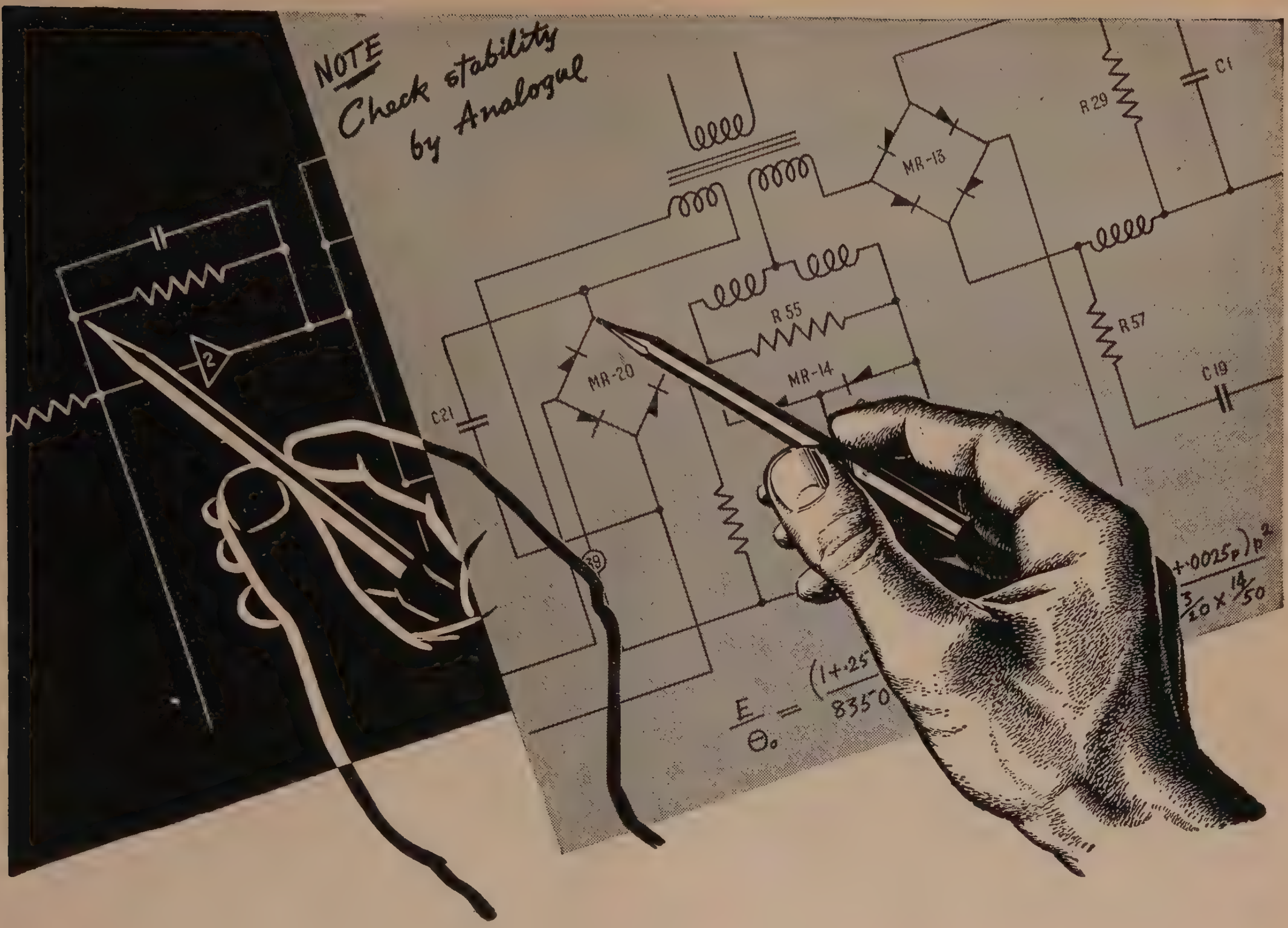
T1/T2 are wires of the nickel-chromium nickel-aluminium type for use at high temperatures and conform to the British Standard Specification 1827: 1952 within the usual tolerances. They also meet the requirements laid down in Air Ministry Specifications 1632 and 1705 covering extension leads.
Special Advance* wire (60/40 copper-nickel) is for use with copper up to 400°C and with iron up to 900°C. The EMF requirements of these two combinations vary according to individual specifications. Special Advance* wires can be selected in most cases to meet these varying demands within the usual tolerances.
Matched Advance* Iron Wires The non-availability of a Standard Iron and the variation of EMF properties experienced with different iron supplies result in some difficulty in reproducing thermocouple EMF properties. To overcome this difficulty we are now able to provide a Special Iron wire matched with Special Advance* to meet certain standard EMF requirements within the normal tolerances.

If you are interested in thermocouple alloys, then you may like to have a copy of Data Sheet No. 2 for reference.

*REGD. TRADE MARK

NICHROME
REGD TRADE MARK

BRITISH DRIVER-HARRIS CO LTD
Cheadle Heath, Stockport, Cheshire



control engineering–

The experience gained by this Company over many years of Control Engineering in almost every industry, together with considerable resources for research and development are available to you for the solution of your present and future control problems.

'ENGLISH ELECTRIC'

control gear

The ENGLISH ELECTRIC Company Limited, Marconi House, Strand, London, W.C.2
Control Gear Division, Kidsgrove, Stoke-on-Trent, Staffs. Tel: Kidsgrove 2141/3
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

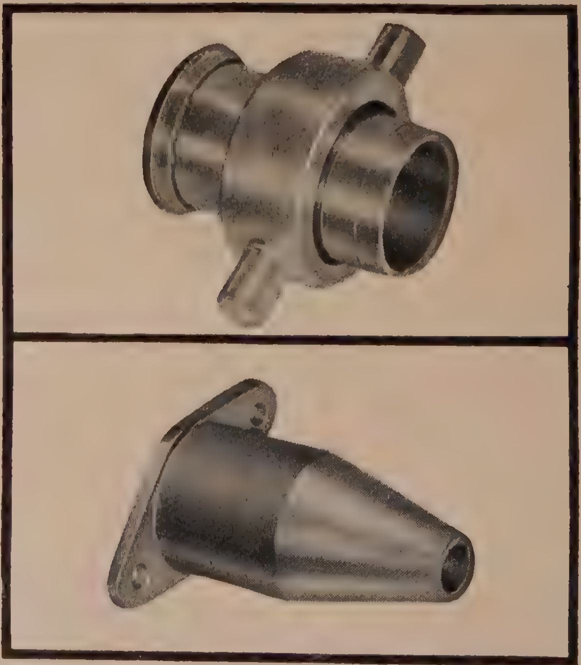
CG. 1 A

The choice is often difficult

May we pick the winner for you . . .

When choosing between Die Castings or Hot Pressings you can count on us for sound, unbiased advice. We make both HOT PRESSINGS in *Brass, Bronze, Copper or Aluminium,* and GRAVITY DIE CASTINGS in *Brass, Bronze or Aluminium.* The unique experience of our organisation . . . two separate yet inter-related operations under one roof . . . will ensure that your choice is correct.

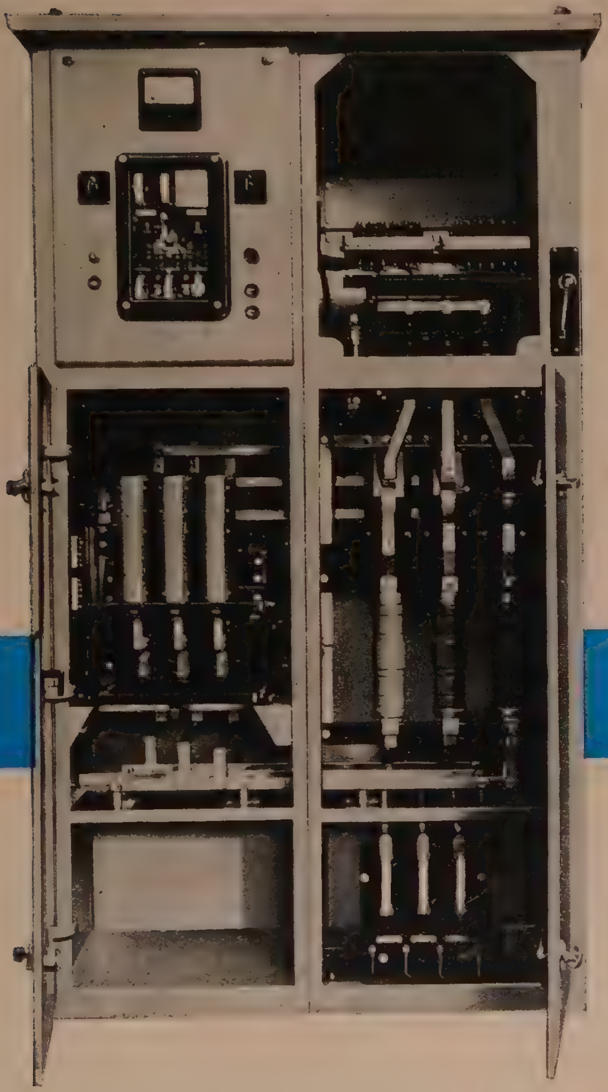
For a constant or phased supply of DIMENSIONALLY ACCURATE PARTS in *Brass, Bronze, Copper or Aluminium*—see us first! Our Technical Representatives are always at your service.



BRASS PRESSINGS (LONDON) LTD.
THE NON-FERROUS DIE CASTING CO. LTD.
NON-FERDICA WORKS, NORTH CIRCULAR ROAD, LONDON, N.W.2
Tel.: GLAdstone 6377

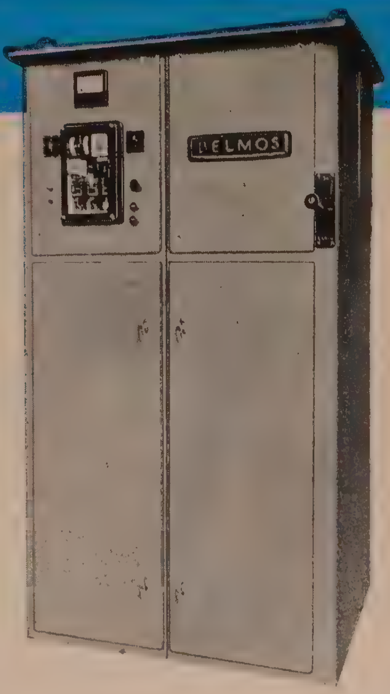
1732

THE BELMOS 3·3kV AIR-BREAK CONTACTOR STARTER



Rigorously tested in the Company's own research laboratory, the type K contactor starter is the latest product of the Belmos development team and continues the well-established Belmos tradition of good design and reliability. Suitable for the direct-on-line starting of 3.3 kV motors up to 600 h.p., it can be housed in a free-standing pillar or grouped with similar units to form a switchboard.

- ★ Air-break contactor rated at 150 amperes. Breaking capacity of 1,300 amperes at 3.3 kV, 0.25 power factor.
- ★ d.c. operating magnet supplied from 3,300/110 volt transformer within the pillar.
- ★ Reversing or Earthing isolator, mechanically and electrically interlocked, with 12 auxiliary switches, a.c. or d.c.
- ★ Busbars designed to withstand 150 MVA for 3 seconds.
- ★ Optional earth leakage protection.
- ★ Comprehensive control arrangements, local and remote, with sequence interlocking and automatic sequence starting.
- ★ Provision for auxiliary services, such as brake protection, local lighting, etc.



the type K starter is fully described and illustrated in leaflet J.240 which is available on request.

Belmos

the Belmos company limited

BELLSHILL · LANARKSHIRE

LONDON GLASGOW BIRMINGHAM NEWCASTLE MANCHESTER SHEFFIELD CARDIFF

NO WORRIES WITH
D.C.3
33 kV-LINE DIAGRAM
2×10 MVA TRANSFORMERS WITH D.C.3 TAP CHANGERS

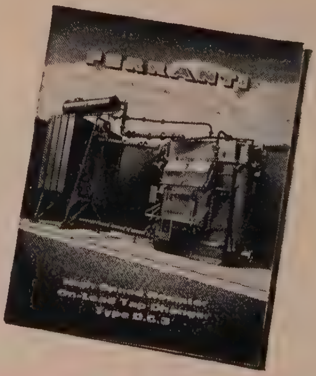
FERRANTI

High Speed Resistor on-load Tap Changer Type D.C.3

OUTSTANDING FEATURES

- High speed resistor transition tap changing gear suitable for 3 phase circuits having a system high voltage of 37 kV r.m.s., on star or delta connected transformers.
- 16 steps (17 positions) available.
- Absolute minimum maintenance required.
- Rated at 350 amps. winding current for any tapping position.
- Access is from the front only.
- Guaranteed impulse strength.
- Arcing contacts will perform more than 200,000 operations at rating equivalent to full load on a 10 MVA transformer.

Write for this Brochure



Ferranti

FERRANTI LTD. HOLLINWOOD · LANCASHIRE Tel: FAllsworth 2000
London Office: KERN HOUSE · 36 KINGSWAY · W.C.2. Tel: TEMple Bar 6666

F1236/2

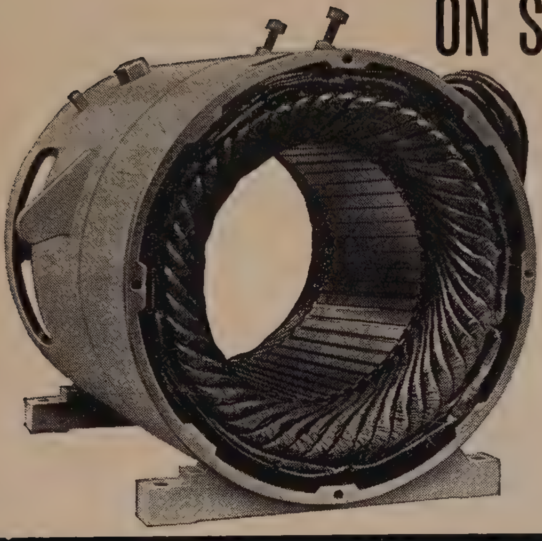
all the cable at Hunterston

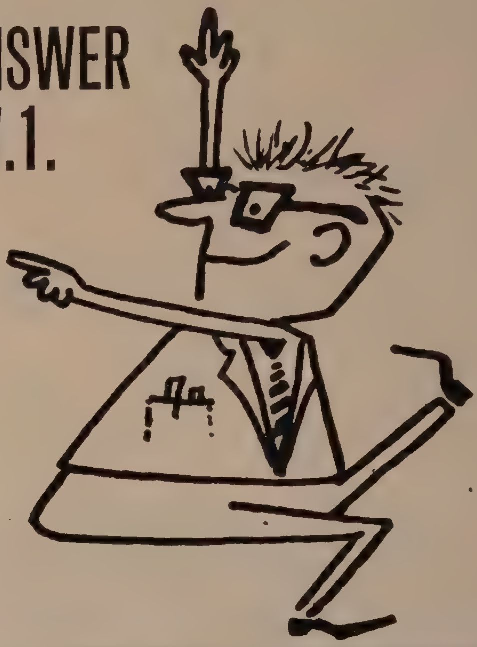
is pg

19,500 yards of Pirelli-General 132 kV. single-core oil-filled cable are being installed between the transformers at the power station and switching station. The insulation of this cable is designed for 110 kV/cm. maximum working stress.
With the completion of this installation the whole of the cabling at Hunterston will have been carried out by Pirelli-General.
Hunterston is being constructed by the G.E.C.-Simon Carves Atomic Energy Group. Consulting Engineers to South of Scotland Electricity Board, Kennedy and Donkin.

PIRELLI-GENERAL CABLE WORKS LIMITED
SOUTHAMPTON AND EASTLEIGH

YOU
PRODUCE
THE PROBLEM
YOU'LL FIND
THE ANSWER
ON STAND W.1.





On Stand No. W.1 at the Electrical Engineers Exhibition a short film will show a few of the many ways in which MINERVA insulating products meet the most exacting requirements set by the Electrical Industry. Pinchin Johnson representatives will be waiting to welcome our many friends and to give advice on the innumerable uses of our insulating specialities.

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THERMO-SETTING VARNISHES · SYNTHETIC COPPER WIRE ENAMELS
OLEORESINOUS COPPER WIRE ENAMELS
BLACK & CLEAR COREPLATE INSULATING VARNISHES
NON-INFLAMMABLE CABLE LACQUERS
HEAT RESISTING INSULATING CLOTH VARNISHES
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ELECTRICAL ENGINEERS
EXHIBITION · STAND NO. W.1

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bearings and structural parts is
maintained to close limits. They are
precision manufactured in large
quantities by the powder metal process
which effects considerable economies
by eliminating intricate machining operations.
Made in Bronze, Brass and Ferrous Alloys.
Wear and shock resistance is high
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and pressures up to 15,000 p.s.i. and higher are permissible
with certain Oilite alloys.

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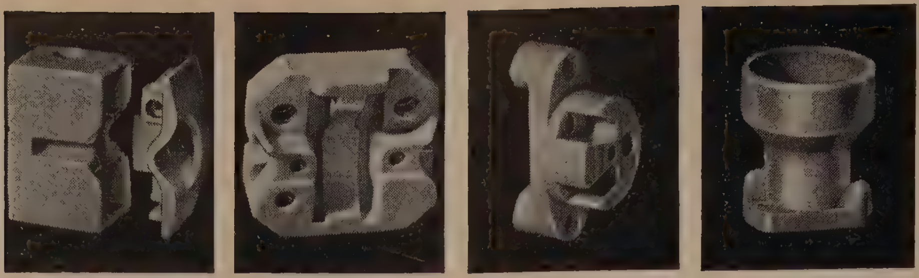
THE MANGANESE BRONZE & BRASS CO LTD *Elton Park Works Hadleigh Rd Ipswich Grams: Oilite Ipswich Tel. Ipswich 55921*



Larger than a man . . . smaller than a thimble!

Manufacturers and public services cannot afford to experiment with so vital a factor as safety—that is why porcelain is the most widely used insulating material. No substitute combines all the properties of porcelain, for example—

High mechanical strength
No deterioration with age
Non tracking
Low initial tooling cost giving flexibility in design.

In B.E.C.M.A. you have at your service the resources, design staffs, technical advisers and testing laboratories of the twelve leading Electro-Ceramic manufacturers.

You cannot beat

PORCELAIN

for insulation

BECMA
BRITISH ELECTRO CERAMIC MANUFACTURERS ASSOCIATION

BRITISH ELECTRO-CERAMIC MANUFACTURERS' ASSOCIATION, FEDERATION HOUSE, STOKE-ON-TRENT

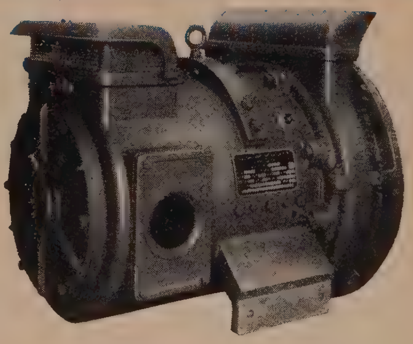
POWER AND CONTROL

***E.D.C.C.
make Motors,
Generators
and Starters
for all marine
purposes,
in standard
and special
designs.***

Illustrated here is equipment especially designed for marine duties and backed by long and successful experience in this field.

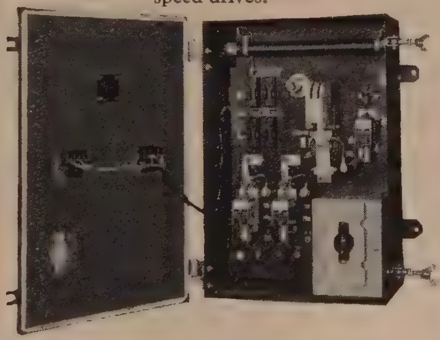
This equipment complies fully with all relevant B.S. specifications, the requirements of Lloyds and British M.O.T.

60 h.p. 220 volt D.C. Marine Motor, drip-proof enclosure.



35 kW. 220 volt D.C. Marine Generator, flange mounted for coupling to diesel engine.

Contactor Starter for D.C. motors available for constant and variable speed drives.



Hand operated Faceplate Starter for D.C. motors, available for constant and variable speed drives.

PLEASE SEND FOR FURTHER DETAILS

ELECTRO·DYNAMIC

CONSTRUCTION COMPANY LIMITED

ST MARY CRAY ORPINGTON KENT TELEPHONE: ORPINGTON 27551 TELEGRAMS: ELEDAMIC ST MARY CRAY

Control Gear Division: BRIDGWATER SOMERSET Tel: BRIDGWATER 2882 Glasgow Office: 40 HOULDSWORTH ST C3 Tel: CENTRAL 2620

P.4282

KENT

electro-ceramics

Low tension electrical porcelain products in a diversity of designs pour out by the million from the Kent organisation every week. Whatever your requirements may be we are well equipped to meet all demands, and over 80 years' manufacturing experience behind our products provides another very good reason why you can specify Kent and be sure.

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TETRA

TUBULAR SHEATHED MINERAL EMBEDDED ELEMENTS

Tetra elements can be produced to customers' own requirements and to conform with recognised British and Overseas Standards. Technical department available for advice and assistance in design.

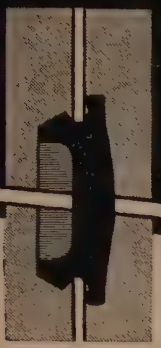
These finned elements can be supplied in lengths up to 12ft.-14ft. and are available in copper, mild or stainless steel and aluminium, straight or bent to requirements.

★ **NEW FLAT CONNECTOR** **Specially designed for the highly loaded kettle element. Conforms to BS.562/10 amps. Samples available on request.**

THE TETRA ENGINEERING CO. LTD. **TETRA WORKS · NORTH END RD. · WEMBLEY · MIDDX.** *Tel.: WEMbley 1066 (5 lines)*

A new Grommet development

THE DOUBLE SEALING EMPIRE RUBBER GROMMET



infinitely accommodating in use: considerably reduces range of sizes because the same grommet can be used with several plate thicknesses or cable sizes

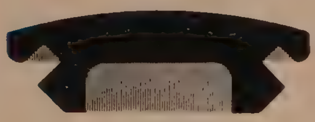
PAT. APP. No. 5255/59

This newly developed self-conforming grommet, because it is immediately self-locking against the elements, is the solution to many of an engineer's sealing problems.

Any one size will not only accommodate itself to a variety of mounting plate thicknesses, but (designed for cable or control rod) will take these in a variety of sizes and be weather-, water- and dust-proof at a variety of angles to the cable or rod.

Because of its capacity to conform to many varying requirements, it enables a workshop stock range of grommets to be reduced to perhaps one tenth of that at present maintained.

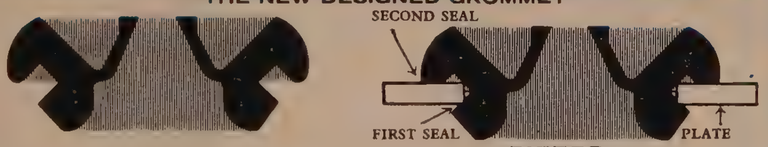
THE NEW BLIND GROMMET



FREE

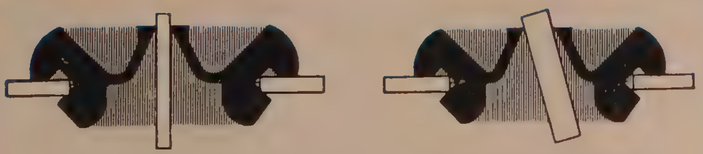
Note how when sprung into position the grommet provides a perfect double seal by its own permanent pressures. The angled groove also creates a tight pressure hold on the metal plate.

THE NEW DESIGNED GROMMET

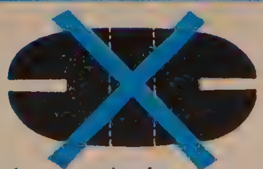


FREE **FITTED**

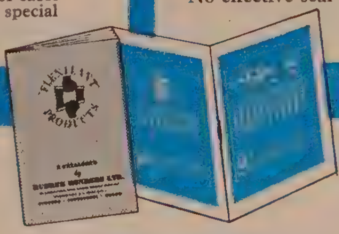
In the cable grommet variety the same double pressure seal is created, allied to tight seal on various diameters of cable. This new grommet gives sound sealing at *all* vital points.



A useful feature of this cable grommet is that by reason of the designed taper of the cable entry and the flexibility of the web, a considerable angle of cable entry and a variety of cable size are possible. This avoids necessity for special grommets with angled bores.



In the conventional grommet, only one thickness of plate and only one size of cable can be accommodated. No effective seal is afforded by the parallel groove.



Now being produced in a range of sizes.

THESE GROMMETS WILL SOLVE YOUR SEALING PROBLEMS.

ENQUIRE *for Catalogue section and detailed particulars.*

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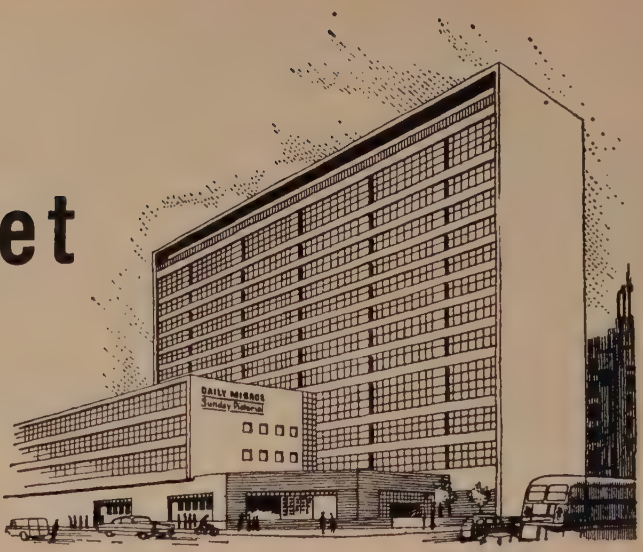
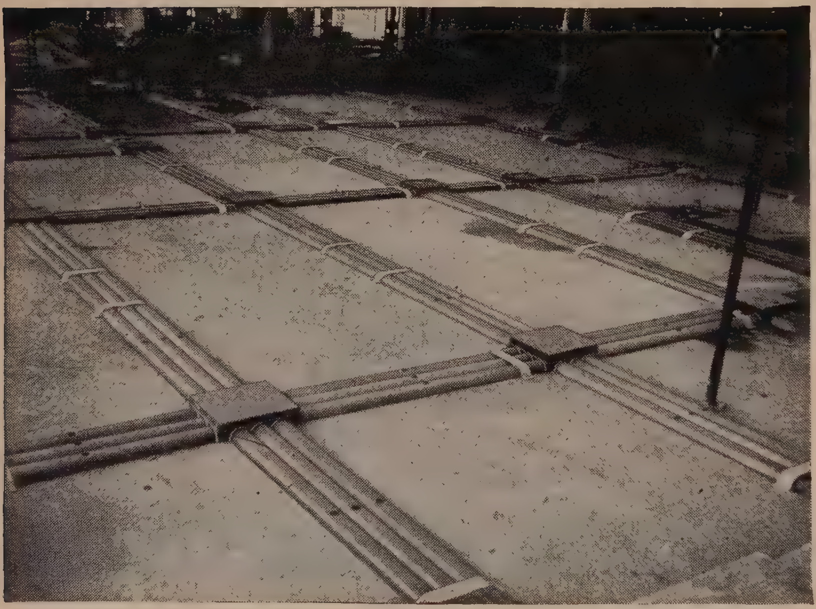
UNDERFLOOR DUCT



for the new Daily Mirror building



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Now and for the future, this immense Key Underfloor Duct installation will solve electrical distribution problems in the 'Daily Mirror' building. The system provides unique flexibility because once the duct is laid, outlets for power and telephones can be added anywhere to suit individual needs. These outlets can later be increased and extended as needs in the building change, without disturbing floors or existing wiring.

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Here closed-bottomed 'dee'-shaped duct is used, but an open-based duct is also available. Both can be economically and speedily installed. The ducts are light in weight, and easy to cut and work with normal wood-working tools. They are cheaper than any other system.

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NEW DADO DUCT is similar to skirting duct and is designed for use at desk height. These two systems and underfloor ducting itself can be used alone or in conjunction with one another in both new and existing buildings.

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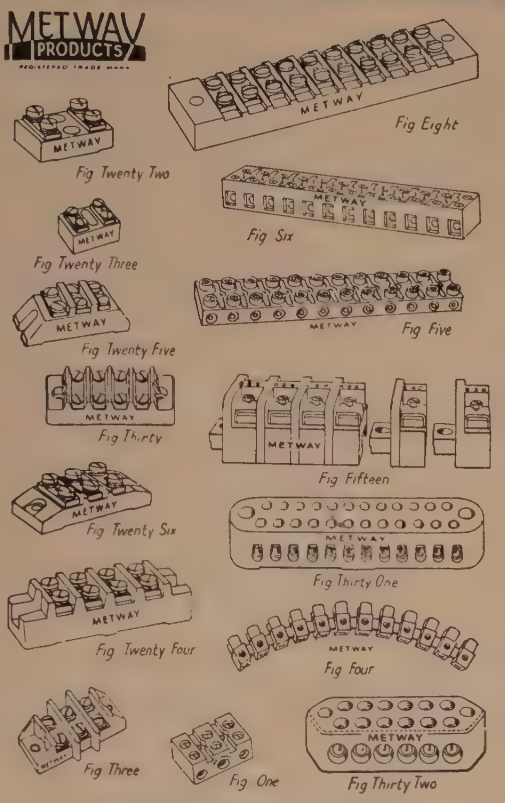

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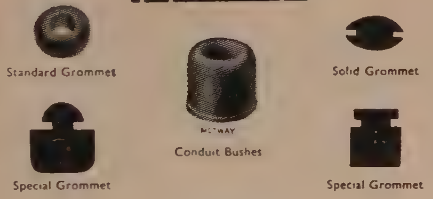

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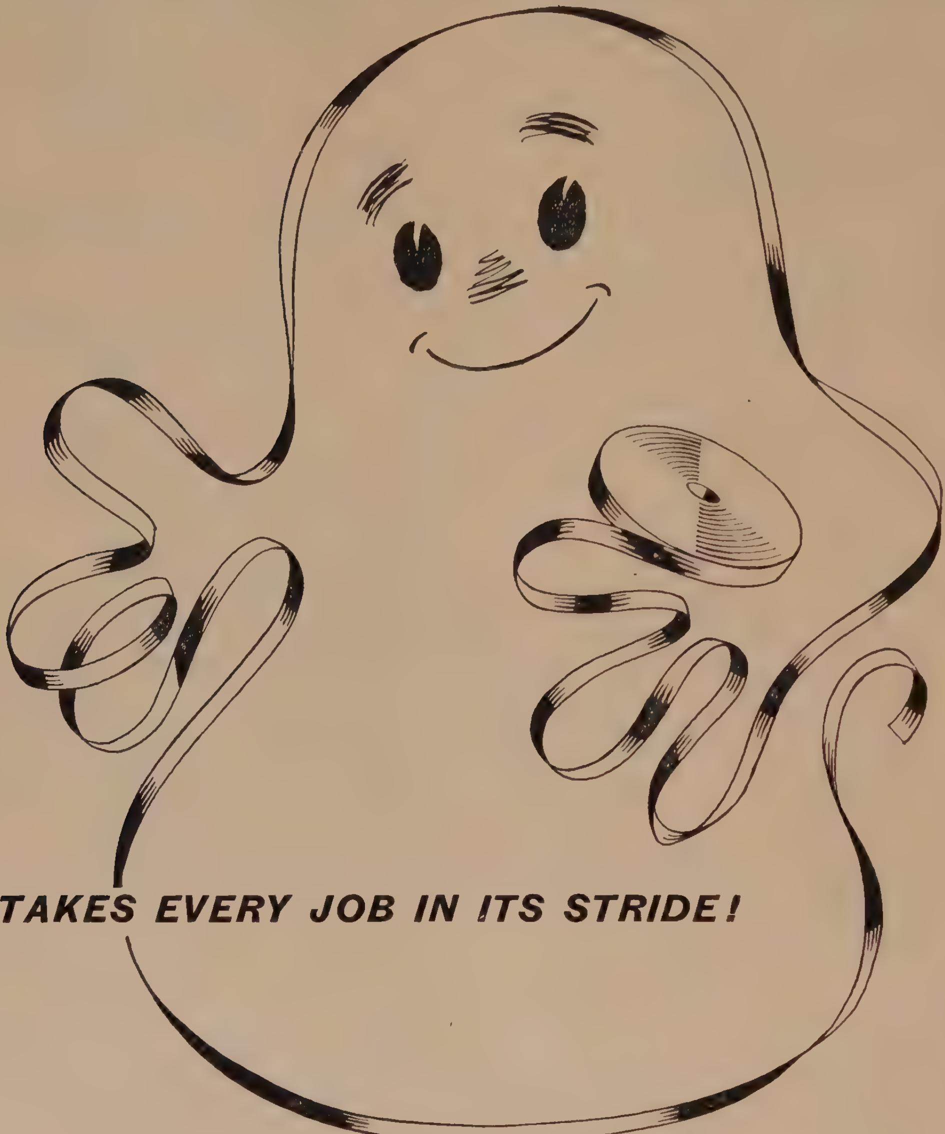

YET IT TAKES EVERY JOB IN ITS STRIDE!

Lasso No. 92 has so many properties, so many uses, we could fill this page with them. And dull reading it would make. A lot of stuff about pliability, water resistance, acid resistance, wrapping, jointing, insulating, binding, splicing — *that* sort of thing. Far better send for our alert young representative, *he* makes it sound interesting. Ask your secretary to drop us a line today.

SEND TODAY FOR OUR WALKIN', TALKIN', THINKIN' REP

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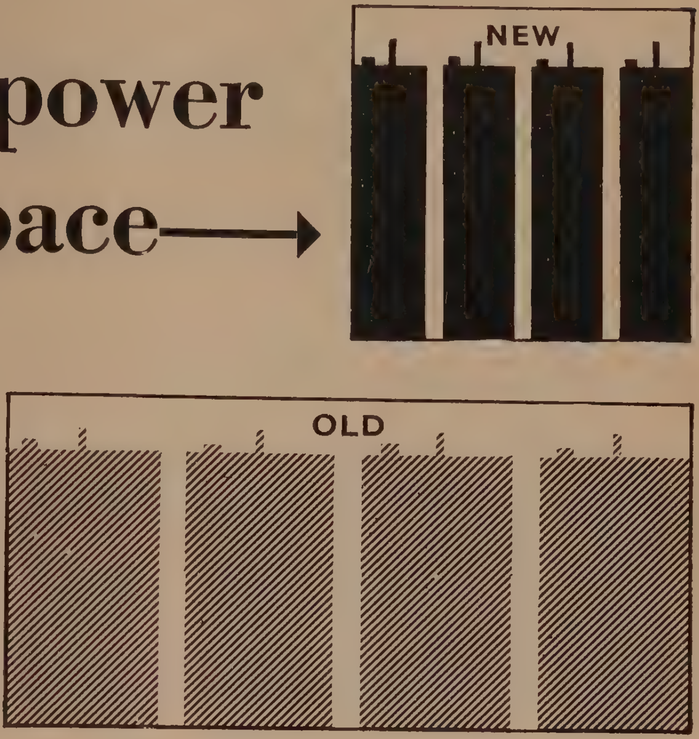
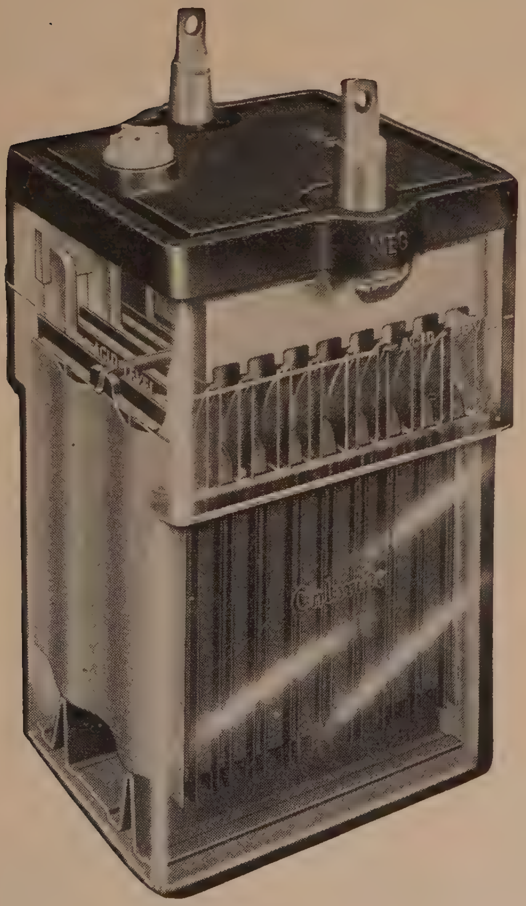
Stand-by power in half the space→



from the new CHLORIDE stationary cell



This new cell is specially designed for standby duties entailing discharge rates between, say, the 3-hour and the very high rates demanded for switch-closing purposes. With its Plante positive and pasted negative plates, Porvic microporous separators and many other improvements in material and in design, this light, robust cell will perform its duties with greater efficiency, with complete reliability and with a saving in battery space of approximately 50%. It is ideal for trickle-charge operation and has all the remarkable length of life associated with the Plante type of construction.

The field in which the new cell is designed to replace current Plante types is a very wide one. Emergency lighting*, switch operation and emergency supply in hospitals, theatres, cinemas and other public buildings, both nuclear and conventional power stations, all rely on trickle-charged batteries. In Great Britain today such batteries occupy millions of cubic feet of valuable space. The new Chloride cell could free almost half of it.

* *The new cell will from now onwards be fitted in all Keepalite units —the Chloride Company's automatic emergency lighting system.*

By the makers of Exide Batteries

A PRODUCT OF CHLORIDE BATTERIES LIMITED · BACKED BY WORLD-WIDE SERVICE

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Watertight Protection

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with REAL Watertight Fittings

Patent No. 568702

Catalogue No. P 5806 gives details of all sizes from 60 watt to 500 watt.

R.E.A.L. *is the registered trade mark of*
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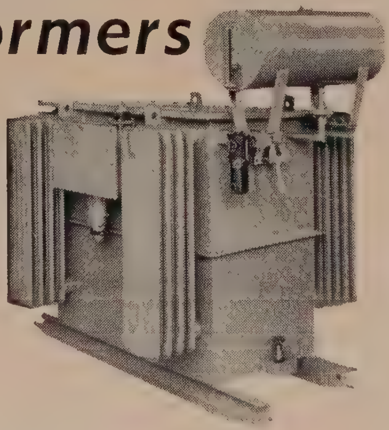

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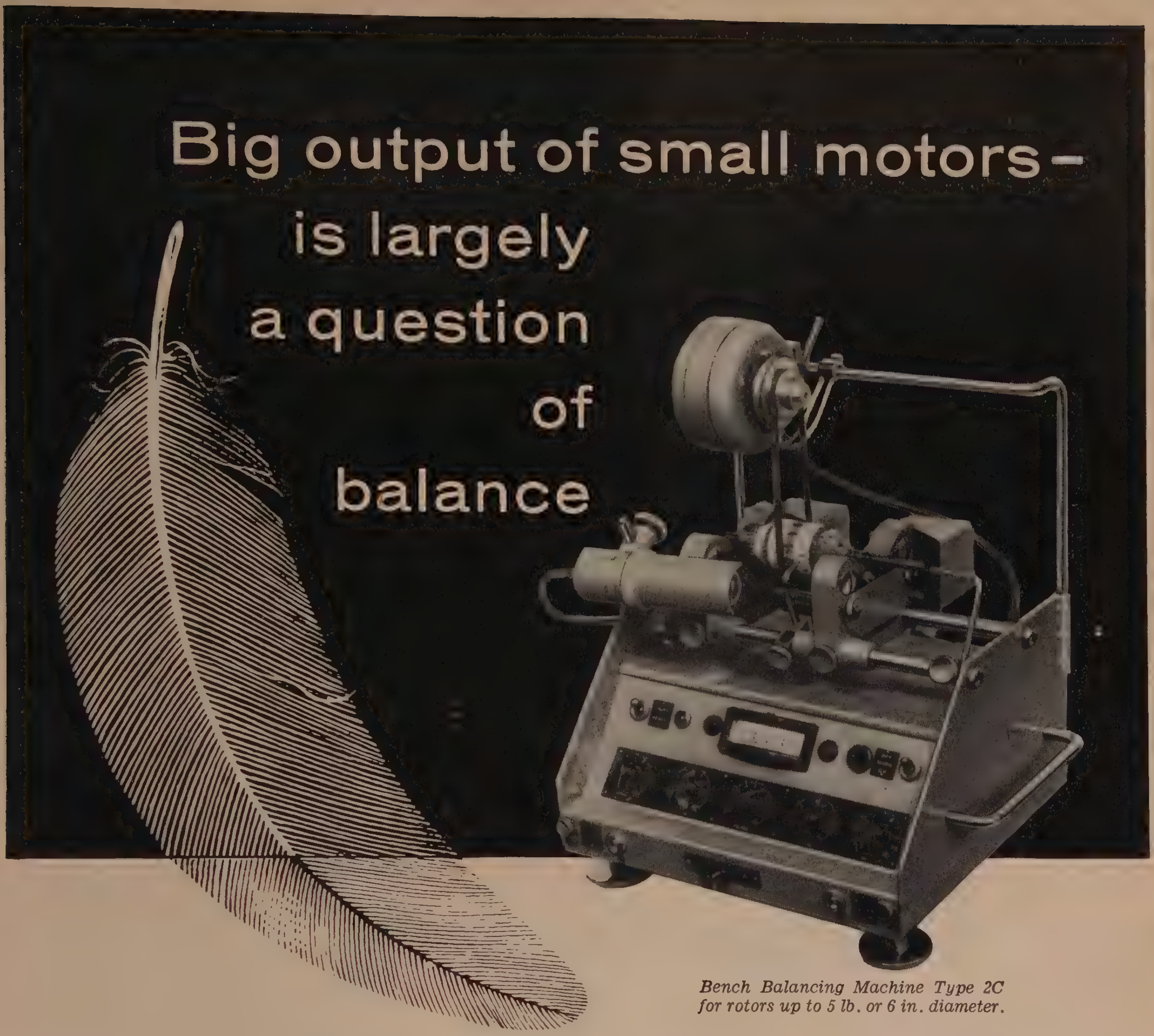

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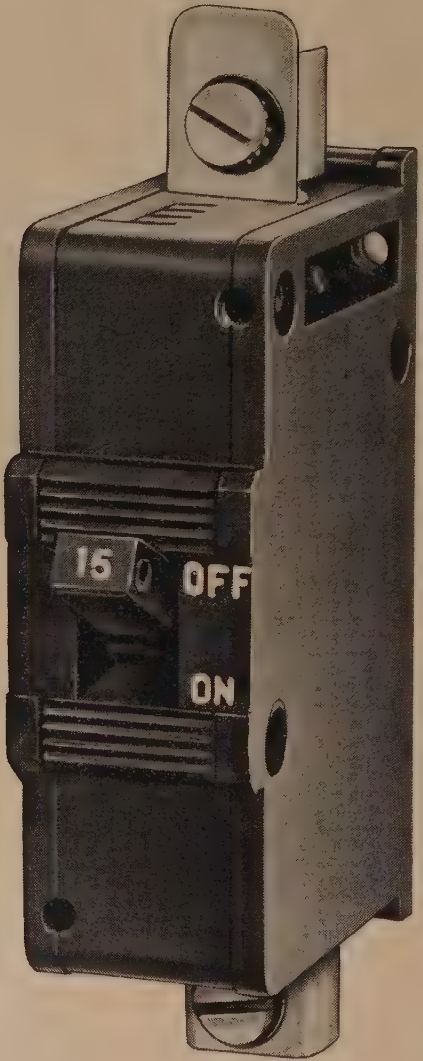

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DUCTER
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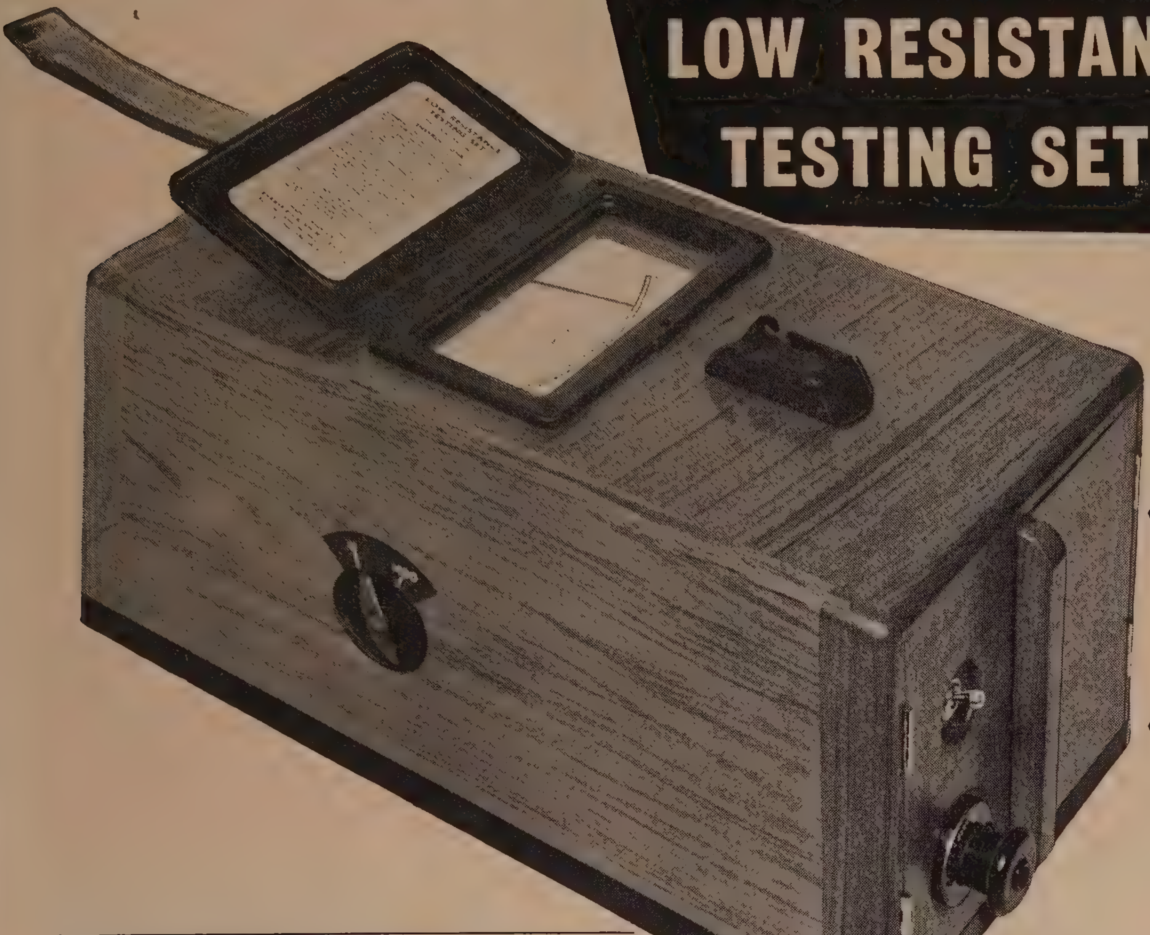
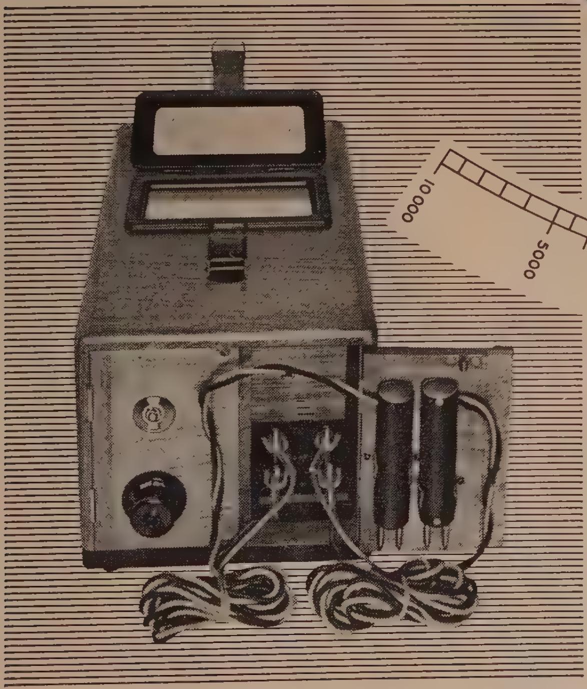
LOW RESISTANCE TESTING SETS

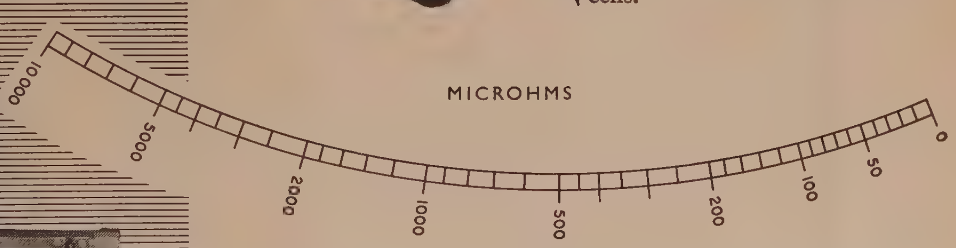


Mains operated instrument.
A similar battery operated instrument also available.

Compartment for leads and testing spikes.



In the battery model, this compartment contains 2 alkaline cells.



An entirely new, self-contained, direct reading testing instrument having a range of measurement from:

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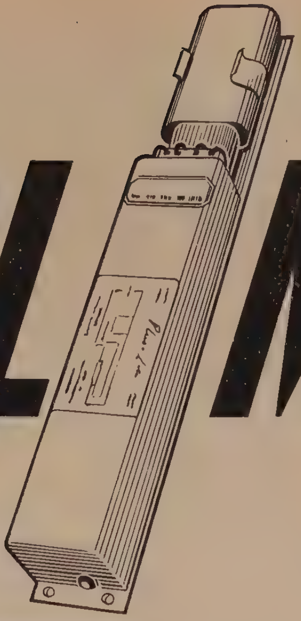

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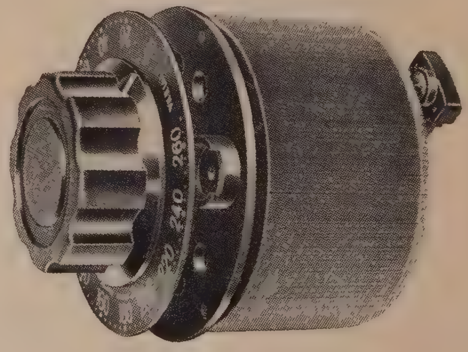

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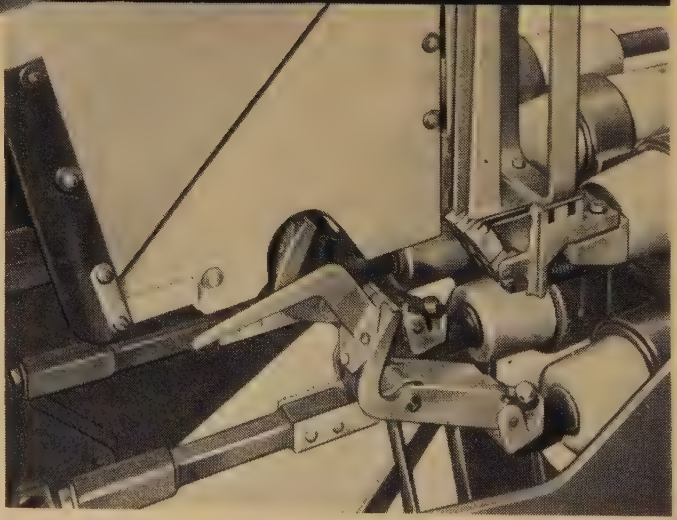

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(*top*) *One of the Boiler House Switchboards.*

(*right*) *Details of switch contacts.*

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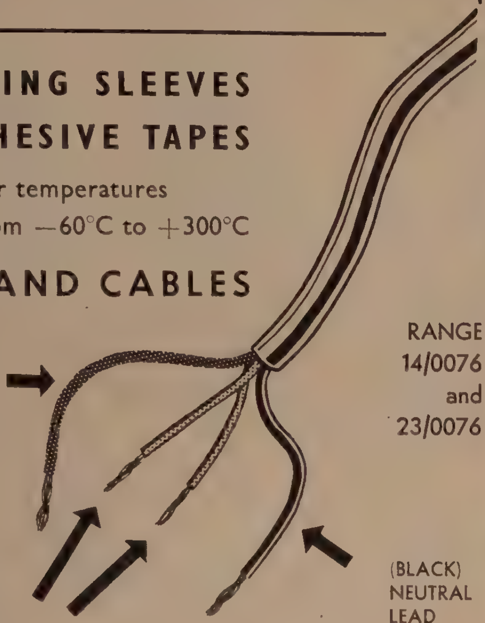

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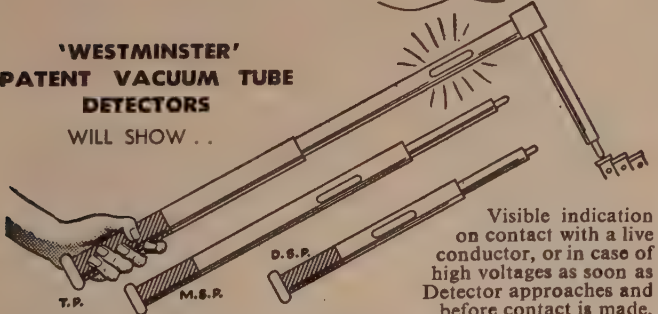

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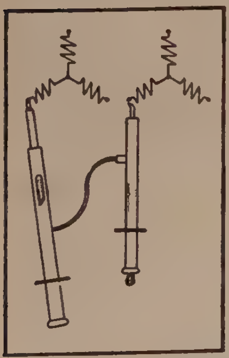

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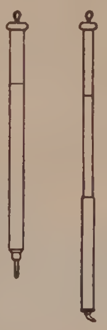

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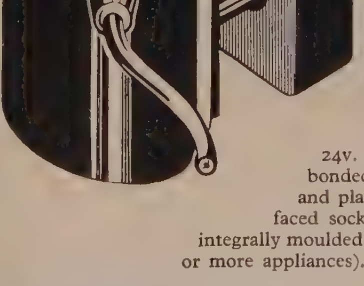

Industry is fully aware of the dangers of electrical accidents. Even so, published figures show that 104 accidents occurred during the last seven years through low voltage equipment (i.e. inspection lamps, soldering irons) or their cables carrying too high a voltage.
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Scale 1/8 full size

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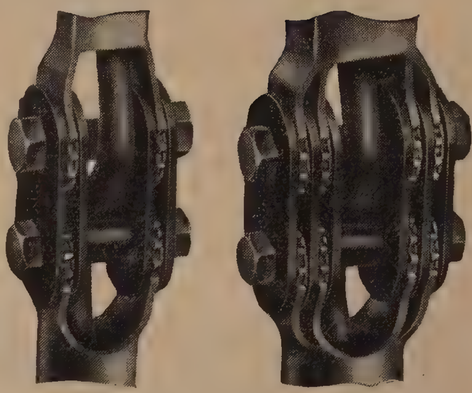

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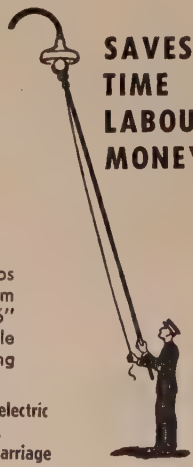

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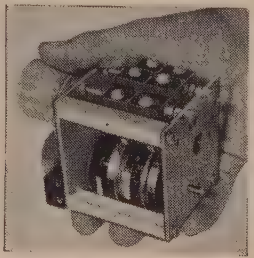

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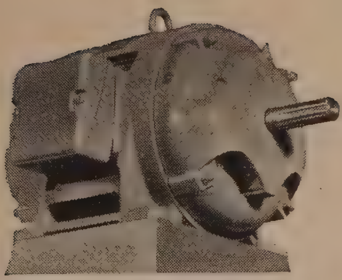

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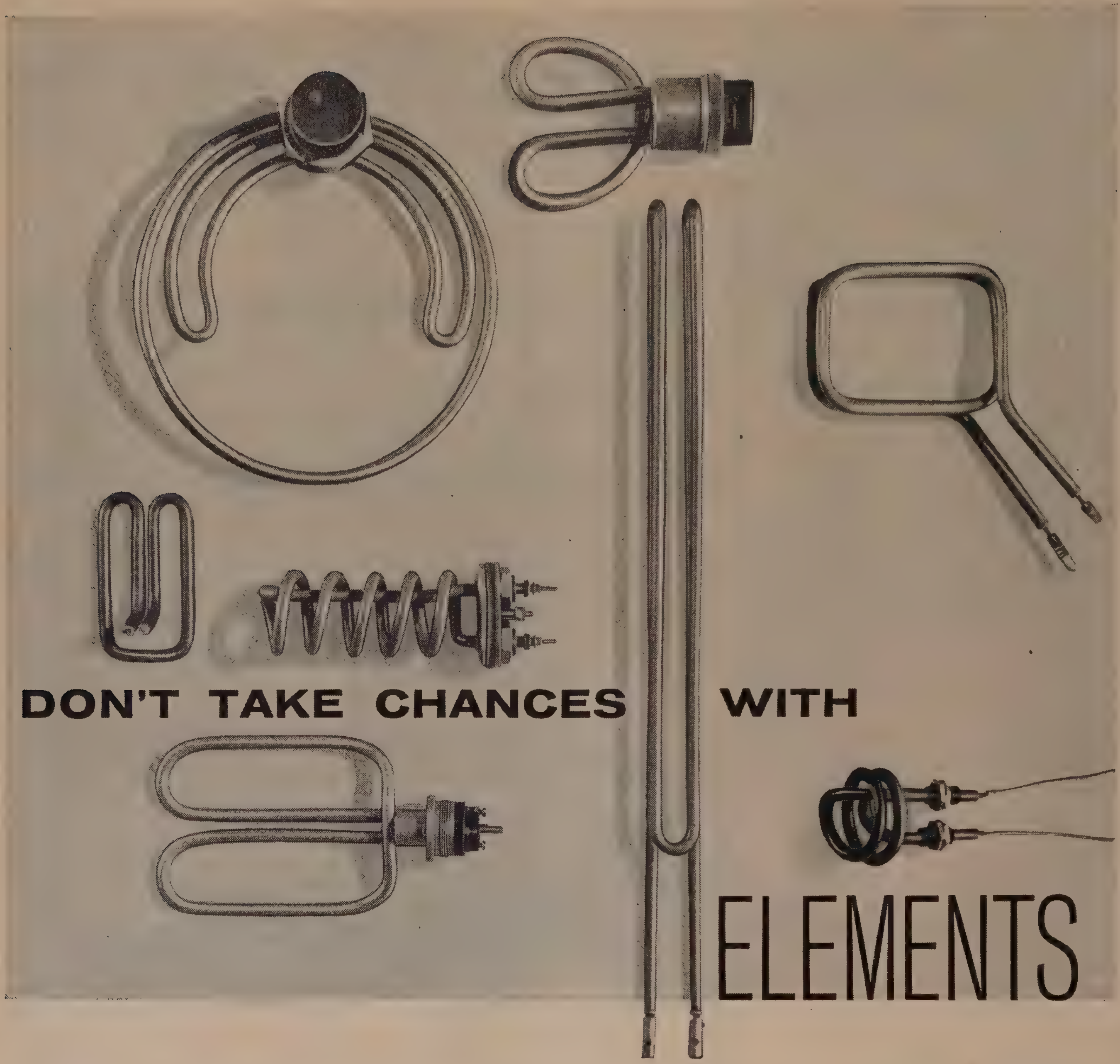

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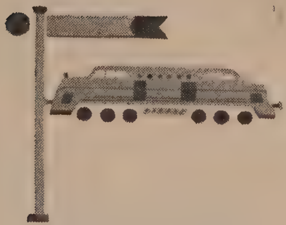

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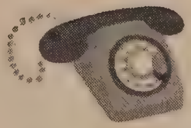

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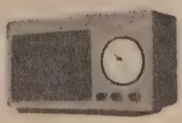

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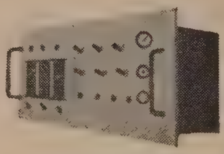

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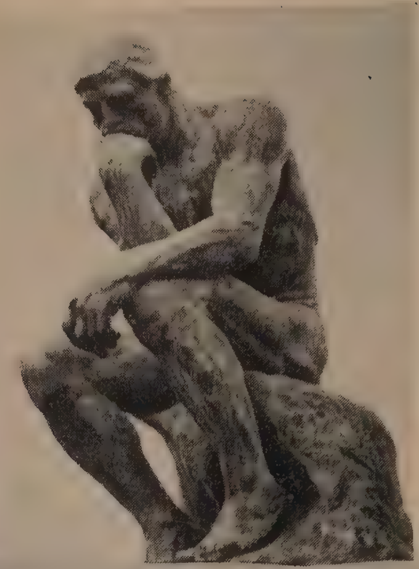

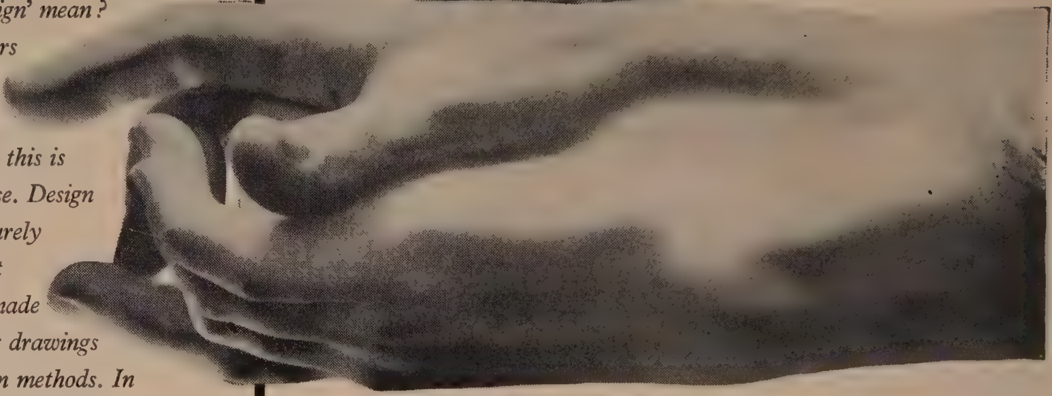

What exactly does 'design' mean? Some electrical engineers restrict it to electrical design which results in a set of figures. But this is only the half-way house. Design in its full sense must surely include everything that dictates what shall be made—down to the working drawings and detailed production methods. In these later stages less can be calculated, more depends on knowledge and on that cerebral computer, imagination, which fed with experience, often delivers its answer as an unquestioned certainty: as a direct feeling for the right job. How right these answers are depends on the experience of the designer—and of the company for which he works.

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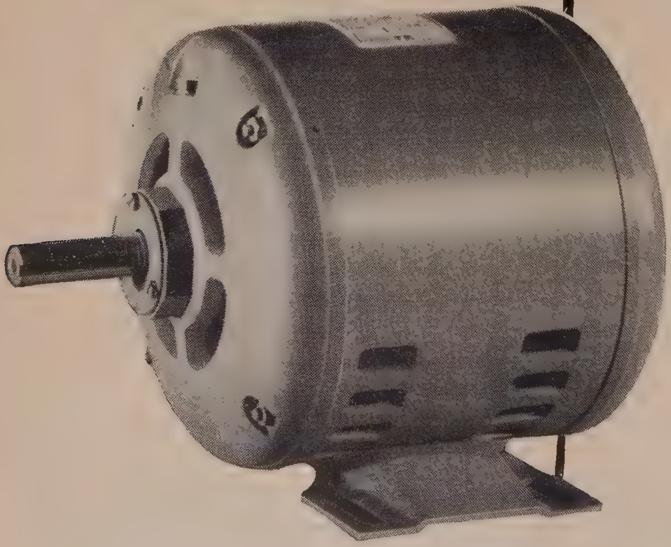

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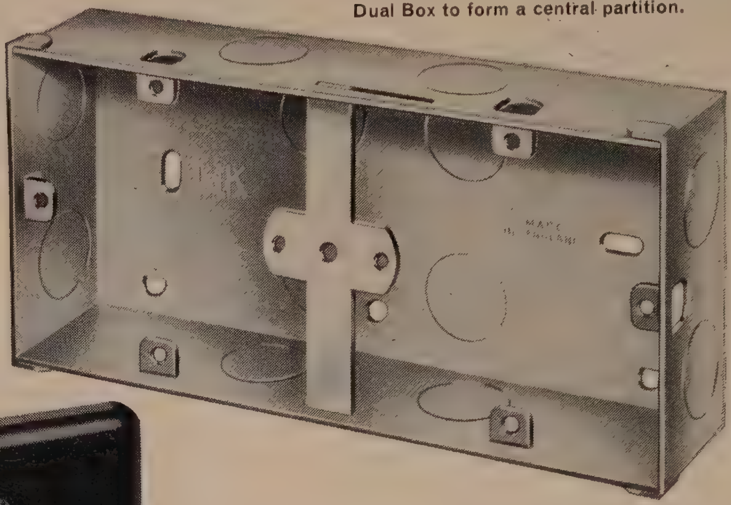
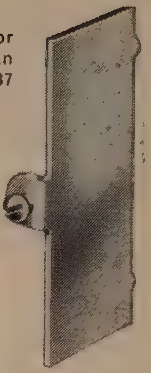
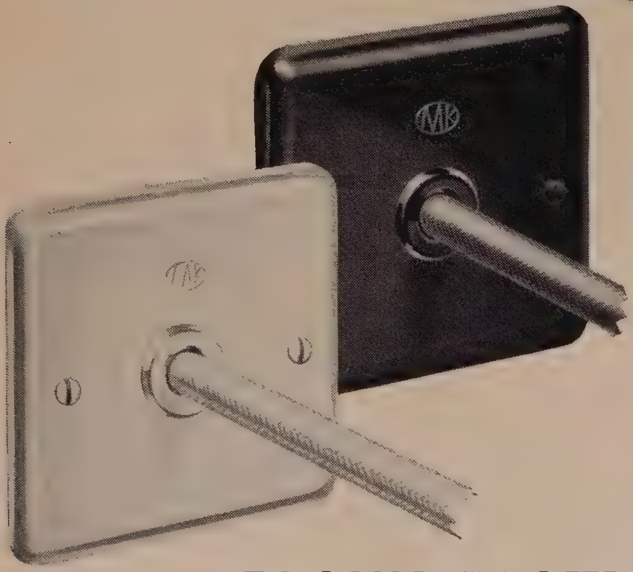


Where it is necessary to separate phases or services—Dividing Screen List No. 888 can be supplied for assembling to List No. 887 Dual Box to form a central partition.





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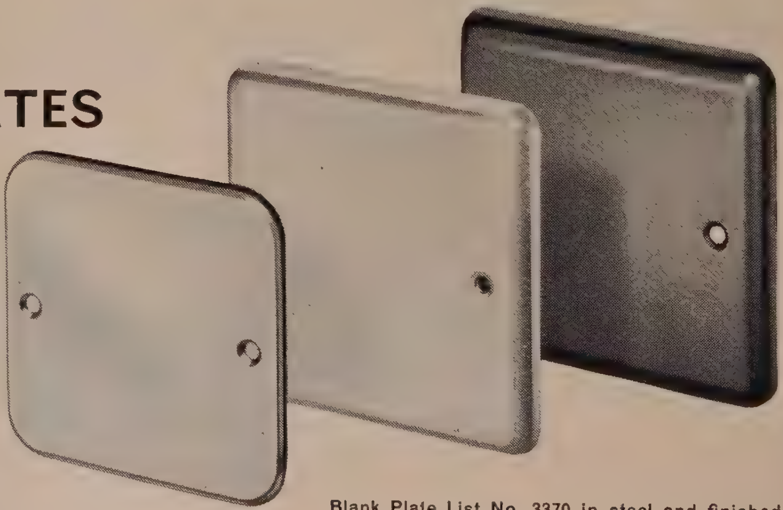

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FRIDAY
11 MARCH
1960

ELECTRICAL REVIEW

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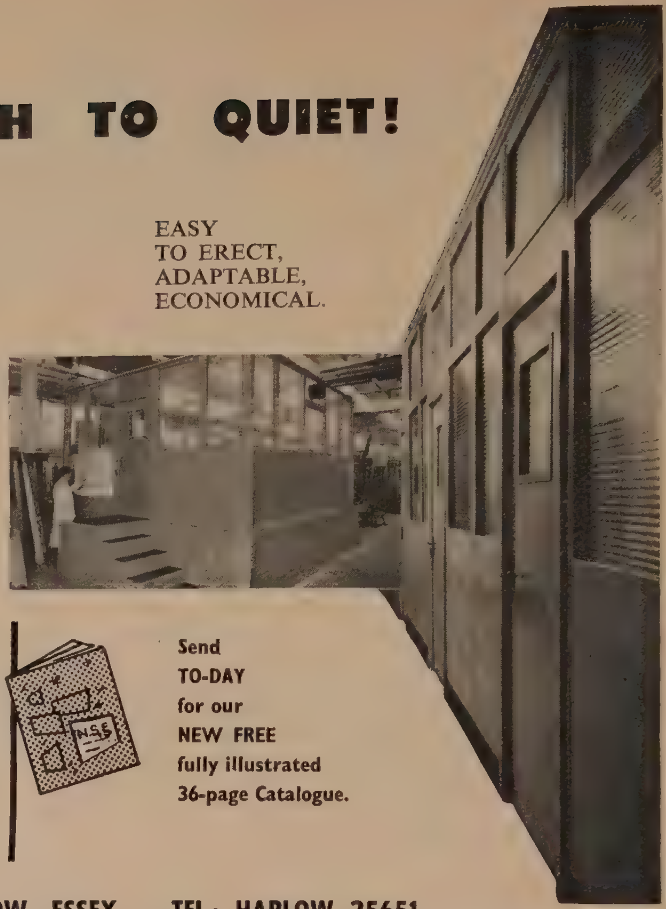

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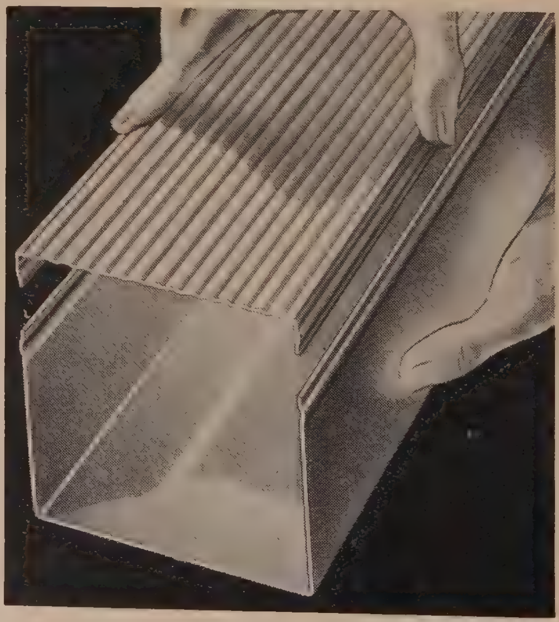

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ELECTRICAL REVIEW

11 March 1960 Vol. 166 No. 11 Established 1872

New Thoughts on Switching

FOR many years semiconductor devices have been regarded as something of a mystery by a majority of electrical power engineers. The first of this class of devices to become available were rectifiers and, although these were manufactured and used on a substantial scale well before the war few, if any, engineers really knew how or why they worked. Nowadays, anyone can find out by consulting the right book, but one gets bogged down with solid state physics which involves the study of electrons and " holes." This can be a most confusing business. Most power engineers probably feel that this sort of thing may be all right for radio, electronic and other similarly inclined " light current " addicts, largely because the more recently developed devices, such as the transistor, are of direct use to them in their work.

On the face of it, the transistor would appear to offer nothing to the power engineer, that is, apart from the fact that the intensive development work which was involved in producing it materially assisted in the production of germanium and silicon rectifiers. However, a new semiconductor device has recently been evolved from the transistor and it seems to us that it is a development which may possibly have far-reaching effects. It is a switch of small physical size and with no moving parts. It will make and break quite heavy currents, will never arc and is not subject to any kind of wear in service.

Although this device is not yet commercially available, a considerable amount of work is being done in connection with it both in this country and abroad. Those of our readers who have taken an interest in transistors will know that the junction type of device consists of three alternate layers of " p " and " n " material. The new semiconductor switch is a four-layer device having a p–n–p–n configuration. There is a heavy connection at each end, and in the normal condition current will not flow in either direction. However, on application of, say, 2·5 V to the inner n or p region the transistor has virtually zero resistance in one direction.

Without delving further into the theory of its operation it can be seen that the device offers a means of controlling heavy currents by means of a small trigger current. In fact, it operates very much like a thyratron or grid controlled mercury arc rectifier. It makes possible the construction of sub-miniature motor control gear and offers very distinct possibilities of dispensing with conventional contactors in many applications. It also works well as an invertor. To sum up, the electrical power engineer may shortly have at his disposal an inherently simple, robust and versatile control device and it is to be earnestly hoped that it will not be subject to the all-too-common lengthy time lag between development and application.

NUCLEAR COLLABORATION

The decision of the G.E.C./Simon-Carves Atomic Energy Group and Atomic Power Constructions to end their negotiations for collaboration means that the Central Electricity Generating Board can now, if it wishes, ask for four, instead of three, groups to tender for its Dungeness station this month and for the Sizewell station in the summer. It was concern at the amount of time and money being expended on fruitless tendering for stations in this country that was one of the main reasons for the move towards collaboration. There is still, however, tremendous prestige, if not profit, attaching to individual success in this field and the failure to find a suitable formula for co-operation was perhaps not surprising. Not only would a considerable give and take be necessary between the two design teams, both of which by now must have definite ideas on the lines they wish to take, but there would be the difficulties of allocating work between a number of production companies.

Nevertheless, the joining together of A.E.I.-John Thompson, Ltd., and the Nuclear Power Plant Company appears to be proceeding smoothly. Their activities, as the Nuclear Power Group, will be further integrated with the commissioning of the two stations at Berkeley and Bradwell on which they are at present separately engaged. Their joint operating experience on these, the first two nuclear power stations in this country, which are due to come into operation next year, will place them in a strong position.

OVERHEAD ELECTRIFICATION

A demonstration was recently made at Colchester station by the British Transport Commission to illustrate the safety of the standard 25 kV overhead electrification system. Loops of wire attached to the contact wire were lowered over a steam locomotive. Flashover to a strongly smoking chimney occurred with a 2in clearance and to dummy men on the boiler and tender with a 1in gap. During the test one man stood with one foot on the locomotive and the other on a steel plate connected to the running rail, while others stood on the station platform holding the locomotive handrail, demonstrating the direct return path provided by the engine. Voltage surges were also applied to the line to simulate thunderstorm conditions, no flashover occurring with normal clearances.

The tests were intended to show an audience largely associated with railways the safety of the new system, but it might equally be thought to imply lack of confidence in certain quarters in the ability of those responsible for the technical aspects of the scheme. Overhead electrification is not a new principle to this country; the higher voltages coming into use merely require greater clearances, the civil engineering works taking place to provide these being well known. Passengers are denied access to dangerous situations and are unlikely to be affected by the use of 25 kV. Railwaymen are familiar with electrical dangers and of the regulations made for their own safety. It is to be hoped that demonstrations on a system with a large designed safety factor involving men in contact with an apparently live locomotive and earth do not cause over-confidence in those unfamiliar with the engineering principles involved, with tragic results.

SWEDISH DEVELOPMENTS

Usually the result of an enterprising electrification policy is a reduction in the cost per kWh as output grows. An apparent paradox shown in the account of the activities of the Swedish State Power Board reviewed on page 479 is that this tendency is likely to be reversed there within a relatively few years. The stimulus given to electrification by many years of availability of readily developed water power, coupled with technological ability to exploit it, makes it probable that within the next decade or so increases in demand will outstrip hydro-electric reserves.

Thermal, especially nuclear, energy is not expected to be competitive in cost with established water-power installations. On the other hand recent considerable advances in civil engineering methods are reducing the cost of, and time taken in, the construction of dams and have made feasible the use of water resources formerly regarded as not worth consideration. International interconnections (perhaps eventually at high-voltage d.c.) to take greater advantage of diversity of demand, are among the possibilities that suggest themselves for postponing the evil day of water-power deficiency.

COAL AND COOLING

Until the advent of the grid, power stations had to be built near the load centres. This limitation was then replaced in importance by the necessity for adequate supplies of cooling water. The other major siting requirement which has still to be met for conventional power stations is reasonable proximity to fuel supplies.

The Nottinghamshire and North Derbyshire coalfield is the largest producer of coal suitable for power stations, and the River Trent, which passes through it, makes this area ideal for siting power stations. Drakelow, Willington, Castle Donington, Staythorpe and High Marnham will together provide 5,320 MW from this area. Now the C.E.G.B. have announced that they have found two further sites close to the Trent at Holme Pierrepont (near Nottingham) and West Burton (two miles south of Gainsborough). Each site is considered suitable for a station of about 2,000 MW capacity. This means that the coalfield, and the River Trent, will soon have to supply and support about 10,000 MW of plant. Extensive mechanisation of the coal mines in the area will, it is hoped, help to ensure adequate fuel supplies.

It is expected that if the dry cooling tower proves to be a commercial proposition, further power stations will be built on the East Midlands coalfield, but without recourse to the River Trent.

There are so many possibilities of damage to the electrical system of portable apparatus that a few are sometimes overlooked. Protection of portable tools is therefore not such an elementary exercise as it might appear at first. The author surveys various systems and shows that most still require periodic testing of the earth continuity conductor

PROTECTION OF PORTABLE ELECTRIC TOOLS

Comprehensive Survey of the Reliability of Various Systems

By J. L. WATTS, A.M.I.E.E.

COMPARATIVELY small leakage currents through the human body may be dangerous if the current is not automatically cut off very quickly either by protective devices or by the person being able to release himself. Electric shocks can also cause dangerous falls in some circumstances. Special precautions against the risk of electric shock may therefore be necessary where there is a possibility of good contact with exposed metalwork of electrical apparatus and with earth. In some cases, it is possible to use " all-insulated " or " double-insulated " electrical appliances. Portable lampholders operating on more than 30 V should always be of the Home Office safety type, which is virtually double-insulated since the metal guard round the lampholder is separated from the lampholder by a considerable thickness of insulating material.

Fuses

For a fuse to melt within about one second, the impedance of the fault should be sufficiently low to allow a fault current equal to about seven or eight times the rated current of the fuse to flow. However, there is a considerable risk that a portable appliance may be plugged into a circuit without any attempt being made to ascertain the size of fuse protecting the socket-outlet. Thus, the protection may depend on two unknown factors, the impedance of the earth fault loop and the size of fuse.

The impedance of the earth fault loop to each socket-outlet should be measured periodically and, from the safety aspect, each portable appliance should be individually protected by a fuse or other device. In the case of appliances operating on a single-phase or d.c. supply having one pole earthed, it is advisable to supply each appliance through a three-pin plug having a suitable cartridge fuse in the non-earthed pole. However, where an appliance is fed from a single-phase or d.c. supply which is not earthed on either pole, as when the supply is derived from a transformer having the mid-point of the secondary winding earthed, a fuse or overload element should be connected in both poles.

It is most important that the continuity of the earthing core of the flexible cable to a portable tool be tested frequently when the appliance is not used with earth-monitoring or earth-proving apparatus. It is suggested that the earthing core be tested daily, or each time the tool is issued from stores. The test should be made by passing an appreciable current (200 to 500 per cent of the rated current) through the earthing core. In the event of only a few strands of the core remaining intact, the defect will then be revealed by the fusing of these strands. Commercial testing sets are available by means of which this test can be made in a few seconds by an unskilled person.

Reduced Voltage

A common safeguard against the risk of serious electric shock from a portable or other appliance is to supply the equipment at a suitable low voltage. The I.E.E. Regulations do not require earthing of the exposed metalwork of apparatus operating on voltages up to 30 V a.c., or up to 50 V d.c. The Electricity Regulations of the Factories Acts, however, call for earthing of the metallic casings of all portable apparatus operating on a.c. of any voltage, or on d.c. over 150 V, in a situation which is not " earth-free." If the voltage is sufficiently low it may be possible for a factory owner to claim exemption from this earthing requirement on the grounds that the conditions are adequate to prevent danger.

Operating an appliance on a sufficiently low voltage may avoid any risk of serious electric shock due to an earth fault on the appliance, but an earth fault on an appliance will result in the current being cut off automatically only if the exposed metalwork is earthed or is connected to some point on the supply. Thus, if the supply is derived from a system having some point connected to earth, an earth fault on an unearthed appliance might allow fault current to pass to earth through some unintended path which, in some circumstances, might involve a risk of fire.

The B.S. Code of Practice 321 advises that where portable electrical appliances, having exposed metal parts, such as drills, are used in industrial situations which are not earth-free, they should operate on not more than 110 V. When fed from an a.c. system, they should be supplied through a double-wound transformer having the mid-point of the secondary winding solidly earthed. In special positions, such as boilers, 12 V lamps are recommended.

Where the supply is from the 110 V secondary winding of a single-phase step-down transformer with earthed mid-point, no point on the supply to the appliance can

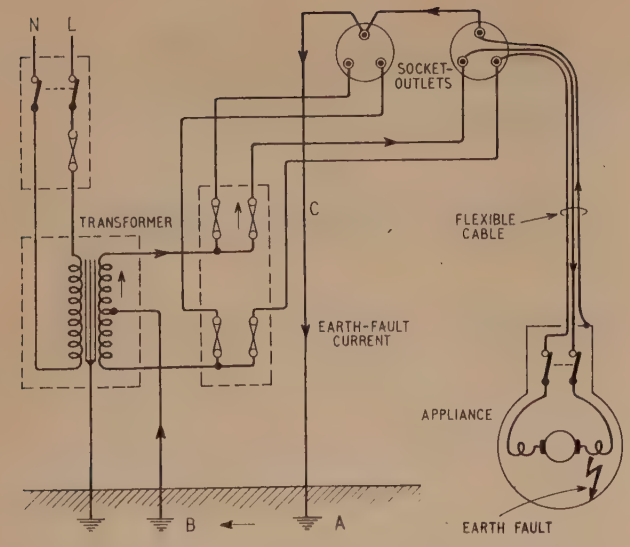

Fig. 1.—Use of step-down transformer to feed portable appliances

reach more than 55 V to earth so long as the mid-point of the secondary winding is maintained at (zero) earth potential, and the insulation of the transformer is sound. Where the mid-point is connected to a separate earth electrode B to that provided for the exposed metalwork A of the appliance, as in Fig. 1, it is particularly necessary to ensure low earthing impedances since the electrodes will be in series.

Transformer Faults

It is also necessary to consider the possible effect of failure of insulation at other parts of the installation, as well as faults on the portable appliances. A breakdown between the primary and secondary windings of a transformer will allow primary current to flow to earth through the mid-point earthing electrode. Unless, or until, the primary fuse melts, the voltage drop between the secondary mid-point and earth will be equal to the product of the fault current and the impedance of the earth path. This voltage will also exist between the casing of the portable appliance and earth if the casing is directly bonded to the earthed mid-point. Protection may be afforded, however, by using a transformer in which the primary and secondary windings are mounted on separate limbs of an earthed core, or are separated by an earthed metal screen. Otherwise, it may be inadvisable to bond the casing of the appliance to the earthed mid-point. The core and/or screen of the transformer should be earthed to a separate electrode from that used for the mid-point of the secondary winding.

Should an earth fault occur on the primary winding, the fault current will pass through the earth electrode provided for the transformer core or case. Again, if the primary fuse is large, or the impedance of the primary earth fault loop is high, the fault current may not be cut off, and there may be a voltage drop between the electrode and earth. For this reason also, it is inadvisable to earth the core through the electrode provided for the mid-point of the secondary.

Frequently the transformer core and case are bonded to the metalwork of the fixed installation through the conduit or otherwise, as in Fig. 2, and are thus earthed through the main earth electrode for the installation. In this case, the transformer core and case may become "alive" should an earth fault occur on some other part of the installation. If the earth fault loop impedance Z between the casing of a large motor and the general mass of earth was too high to cause melting of the comparatively large fuse F during an earth fault on the motor, the voltage drop between the motor frame and earth would also exist between the transformer core and earth. It would also exist between the mid-point of the secondary windings and earth if this point was earthed through the same electrode; and would also exist between the metal casing of the portable appliance and earth if the casing was also bonded directly to the mid-point of the secondary winding as in Fig. 2. Thus, the mid-point of the secondary winding should always be earthed through an electrode which is outside the resistance area of that used for the transformer core and case.

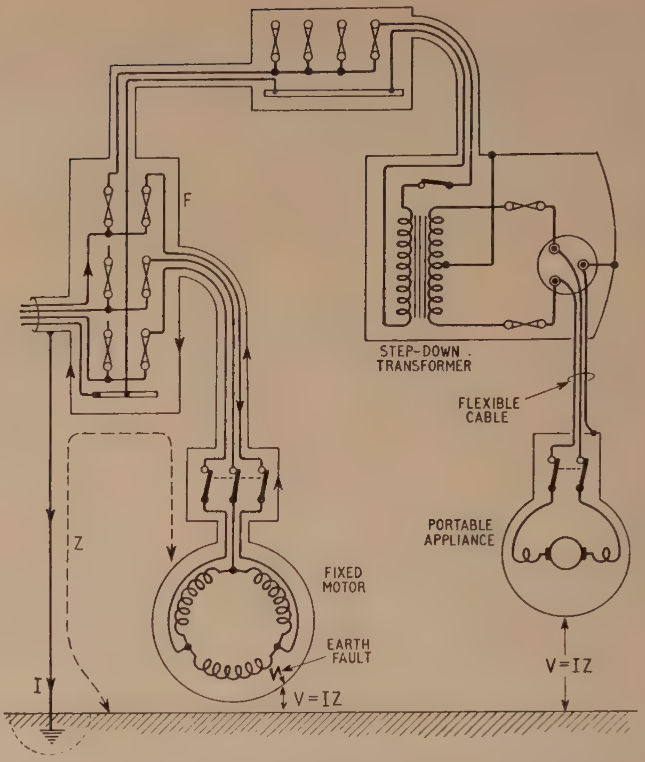

Fig. 2.—Effect of an earth fault on a fixed appliance bonded to a portable appliance

Earth-Leakage Circuit-Breakers

Standard types of voltage-operated earth-leakage circuit-breakers are available for the protection of portable appliances, as in Fig. 3. With this system, the exposed metalwork of the appliance(s) is connected to earth through a leakage trip coil A which should cut off the current if any earth fault causes the exposed metalwork to reach not more than 40 V to earth if the trip coil earth electrode B has a resistance of 500 ohms, or not more than 24 V to earth if B has a resistance of 200 ohms. This system is thus effective with quite high earthing impedances.

If the exposed metalwork of the appliance is connected to earth only through the trip coil A, leakage current exceeding about 15 to 65 mA should cause the breaker to open in about 0·015 sec. However, the metal casing of the appliance might also be earthed directly, either intentionally, or unintentionally as when the appliance rests on an earthed structure or is used to drill structural steelwork or the like. The voltage-operated e.l.c.b. will still trip if an earth fault causes the metalwork of the appliance to reach a dangerous voltage to earth. However, with direct earthing, the trip will permit higher earth-leakage currents due to the parallel direct-earthing path, and will not protect the operator against an earth fault on some other circuit having exposed metalwork bonded to, or in contact with, the exposed metalwork of the portable appliance.

The tripping mechanism, trip coil A, earth electrode B, and the insulated earthing lead C can be tested by simply pressing the test key D which connects the live pole of the supply to B through the trip coil A and the high resistance E. This does not, however, test the vulnerable earthing core of the flexible cable to the appliance. Where the appliance is earthed only through the leakage trip coil a complete test can be made by connecting the live terminal of the appliance to the case momentarily through a suitable resistor or lamp (of about 25 W), when the breaker should trip.

When the appliance is also directly earthed, a higher test current may be required. One method of testing which may be adopted is to connect the 40 V secondary winding of a double-wound transformer between the casing of the appliance and an earthed point some distance from B, when the breaker should trip. It should, however, be noted that these tests merely confirm that the protective system is operative at the time it is tested. The tripping mechanism should operate if only a few strands of the earthing core remain intact, but there is always a possibility that these might soon break, or become fused by earth-fault current passing to a direct-earthing point. It is, therefore, advisable that the earthing core be tested periodically with a substantial test current.

Other Protection Devices

The general layout of the Butcher-Black & Decker protective system applied to single-phase appliances is shown in Fig. 4. The transformer is double-wound and may be of 1 to 1 or other ratio. With this system, the mid-point of the secondary windings is earthed through the sensitive leakage trip coil A, and the metalwork of the appliance is directly earthed, as may be required by regulations. The unit may incorporate a testing device for the earthing core of the flexible cable. Provided the earthing system is intact, the voltage applied between either terminal of the portable appliance and earth is limited to half the secondary voltage and quite small earth-leakage current on the appliance will operate the trip coil to switch off the supply. The protection is effective even when the earth electrode has a resistance of several hundred ohms. The exposed metalwork of the portable appliance should not be bonded to exposed metalwork on the rest of the installation, and the earth electrode B should be outside the resistance area of the earth electrode provided for the other exposed metal.

One way in which this protective system may be applied to protect high-frequency tools supplied through a fre-

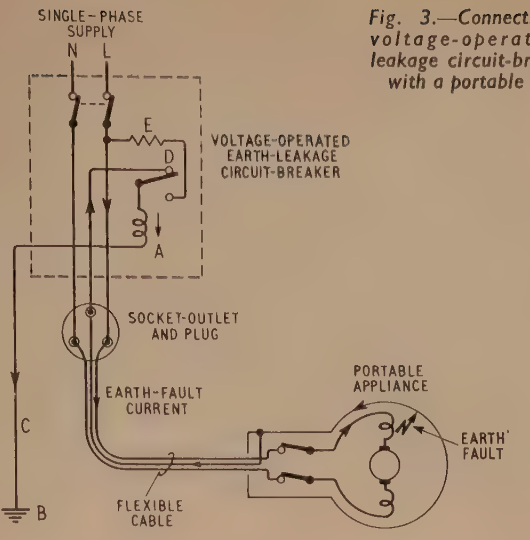

Fig. 3.—Connections of a voltage-operated earth-leakage circuit-breaker used with a portable appliance

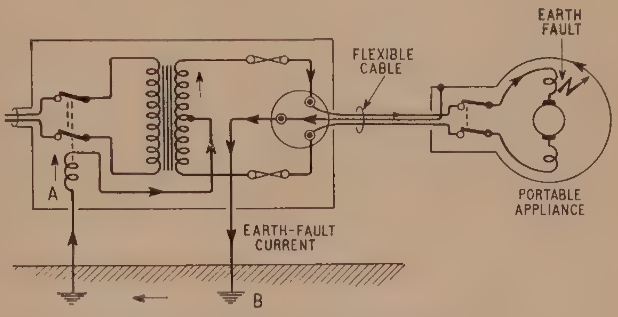

Fig. 4.—General arrangement of the Butcher-Black & Decker protective system for portable tools

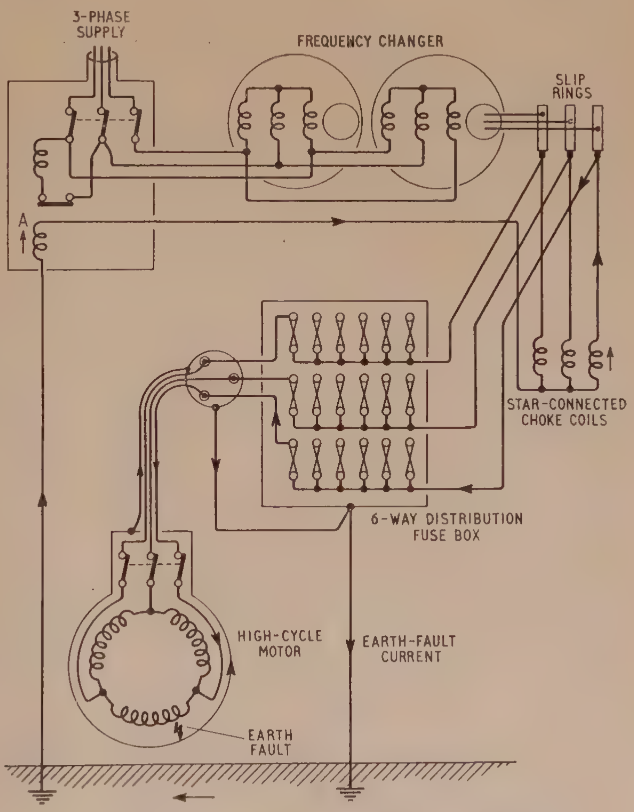

Fig. 5.—One arrangement of the Butcher-Black & Decker protective system applied to high-frequency three-phase motors fed through an induction frequency-changer

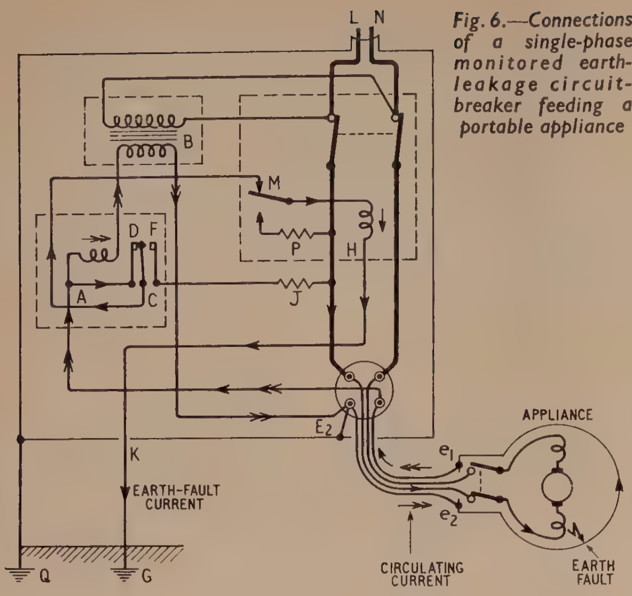

Fig. 6.—Connections of a single-phase monitored earth-leakage circuit-breaker feeding a portable appliance

quency changer is shown in Fig. 5. If the neutral point of the convertor output is available, this can be connected to earth through the leakage trip coil, otherwise an artificial neutral point can be created by means of three star-connected choke coils, as in Fig. 5.

With these systems periodical testing of the earth-continuity conductor of the flexible cable to each appliance is required to ensure safety. With some other systems, however, the portable appliance can be used only when the earthing core is intact. Fig. 6 shows a monitored system in which a four-core flexible cable is used to feed a single-phase appliance. A similar scheme can be used with three-phase appliances fed through a five-core cable. An essential requirement is that the earthing cores of the flexible cable are connected to two different points e_1 and e_2 on the appliance. When the plug is inserted into the socket-outlet, the coil A of the relay will be energised only if the earthing cores of the flexible cable are intact and are connected to the metal casing of the appliance. In this event, current from the 12 V secondary winding of the transformer B will circulate through the earthing cores and the coil A as indicated by the double arrows. The coil A will then close the contacts C-D to connect the metal casing of the appliance at e_1 to the earth electrode G through the leakage trip coil H. If either of the earthing cores to e_1 or e_2 should break or become disconnected the coil A will be de-energised and the contacts C-F will close to connect the live pole of the supply to G through the resistor J and trip coil H, and the trip coil H should open the breaker. Should an earth fault occur on the portable appliance the fault current will flow from e_1 via C-D and through the trip coil H to trip the breaker, as indicated by the single arrows. The circuit-breaker, leakage trip coil H, earth electrode G and the earthing lead K may be tested by means of the test key M which connects the live pole of the supply to G through the trip coil H and the resistor P.

It may be noted that the metal casing of the portable appliance is directly earthed through the earthing core connected between e_2 and E_2 to Q, as may be required by regulations. It is advisable that the unit be earthed to a separate electrode Q from that provided for the rest of the installation, since the unit cannot protect the operator against voltage transmitted to E_2 and e_2 from the metalwork of other faulty apparatus which might be bonded to the casing of the unit.

DRAGON BUDGET

THE Board of Management of the O.E.E.C. high temperature reactor project (Dragon) held its third meeting, under the chairmanship of Dr. Sigvard Eklund of Sweden, on 23rd February. The meeting approved the project's budget for 1960-61, which envisages an expenditure of £2,830,000, which represents some one-fifth of the total forecast expenditure of £13,600,000 over the five-year period. The budget includes £950,000 for the reactor plant and buildings, £910,000 for extra-mural research and development and £970,000 for the maintenance and work of the project staff at Winfrith.

The Board approved that the following offers of appointment should be made: head of administration, R. K. Andresen of Norway; chief engineer, Gianfranco Franco of Euratom; deputy chief engineers, S. B. Hosegood, U.K., and R. Tron of Euratom. These appointments will complete the senior staff structure of the project. The Board noted that, of a total of 14 senior staff including the chief executive (Mr. C. A. Rennie), half are from the U.K. and half from the other signatories. A large proportion of the staff required for design and construction of the reactor experiment has already been recruited, and it is expected that the remainder will be available within the next three or four months. The staff will eventually number some 240.

The Board approved proposals for collaboration between the Dragon project and the United States Atomic Energy Commission. Under these proposals information will be exchanged concerning the development of the Dragon project and of the similar reactor project under construction in the U.S.A. under contracts between the U.S.A.E.C. and the Philadelphia Electric Company and General Dynamics Corporation.

Finally the Board extended for a fourth year the terms the office of Dr. Eklund (Sweden) and Sir William Penney (U.K.) as chairman and vice-chairman respectively.

Electrical Research Journal

THE eighth issue of the Electrical Research Association's house journal *Co-operative Electrical Research* is the first of a new series to be published quarterly instead of half-yearly. Abstracts as well as titles of reports, lists of translations and bibliographies available to members will be included, with information on new researches started, details of any major items of equipment acquired and staff news and other items thought to be of general interest. Such information has been published in the past in the annual report, the research programme and the annotated list of reports. This issue, which contains articles on polymeric insulation and the vacuum switch, is obtainable from the Association at Thorncroft Manor, Dorking Road, Leatherhead, price 2s 6d, plus 6d postage.

The CERN 25 GeV Proton Synchrotron

AN ESSAY IN INTERNATIONAL CO-OPERATION

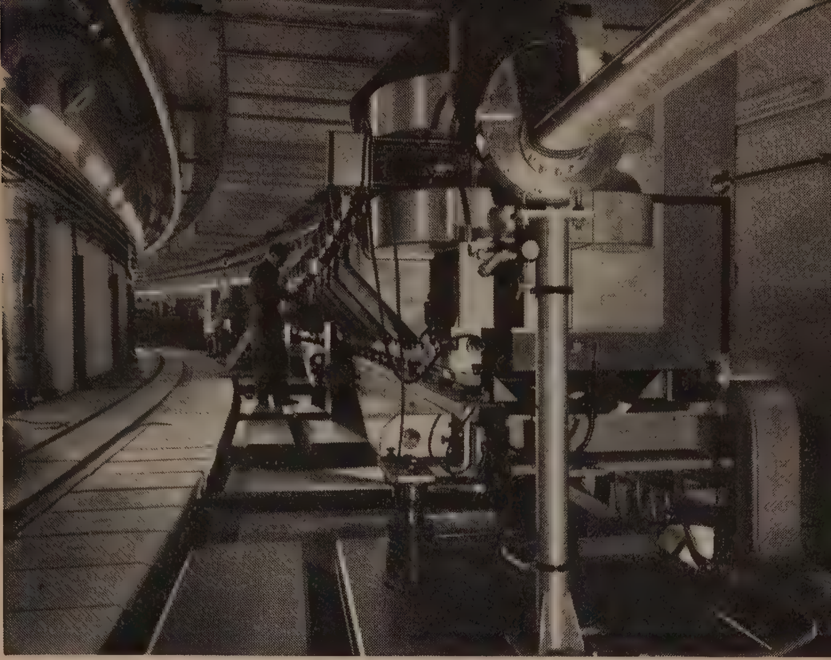

Fig. 1.—View inside the tunnel. The vacuum chamber can be seen in the foreground entering a magnet unit

The large particle accelerator that has been built at Geneva for the European Organisation for Nuclear Research is notable not only for its size but also for the many intricate problems of civil, mechanical and electrical engineering that have been overcome by an international team of scientists and engineers, and by manufacturers in many countries

FOR the first time in twenty years Europe can claim, albeit temporarily, to possess the biggest machine for the acceleration of charged nuclear particles to high energies. After six years' work the 25 GeV proton synchrotron of the European Organisation for Nuclear Research,* at Meyrin, near Geneva, was completed at the end of November last year and a few weeks later it was operated up to and beyond its designed energy. There remain, however, several months of measurements before sufficient is known about the behaviour of the machine to exploit it as a working nuclear physics tool. Nevertheless, its performance has already amply justified the faith of those whose belief in the merits and practicability of international collaboration led to the formation of CERN.

Historical Background

The possibility of forming an international organisation for nuclear research was discussed as early as 1947. It was realised that European contributions in this field, which had been outstanding in the past, would be handicapped because the cost of the large machines needed in nuclear physics was such that few, if any, Western European nations could afford them. The first practical

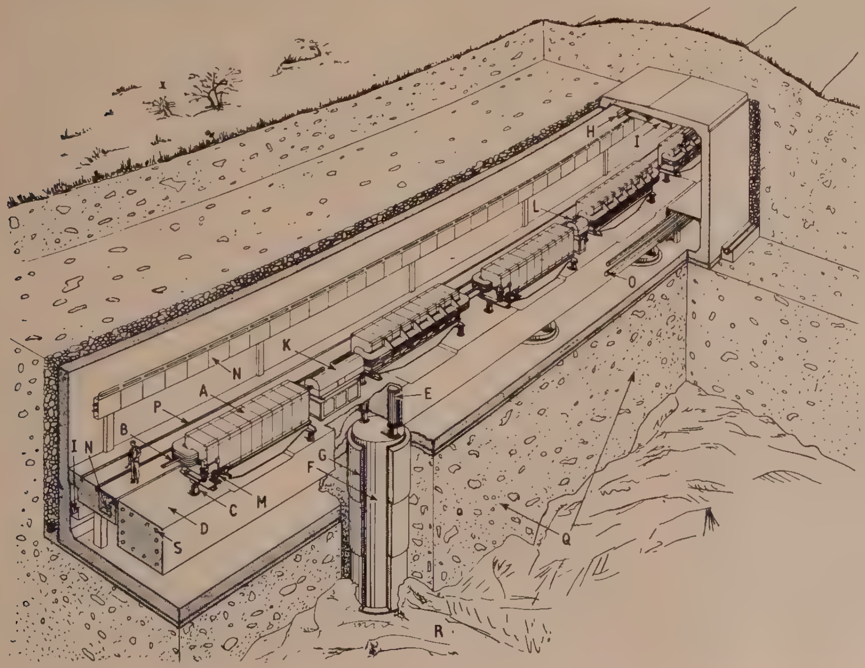

Fig. 2.—Perspective of a ring section of the CERN proton synchrotron.

A = magnet unit; B = vacuum chamber; C = screw jack; D = concrete girder independent of the building and resting on E = elastic supports; F = concrete column based on rock; G = bitumen; H = 2 ton crane; I = air-conditioning; K = accelerating cavity; L = octupole lens; M = vacuum pump; N = electric cables; O = magnet water cooling; P = railway track; Q = earth; R = rock; S = temperature regulating water pipes

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* The word CERN comes from the initials of the French title of the original organising committee.

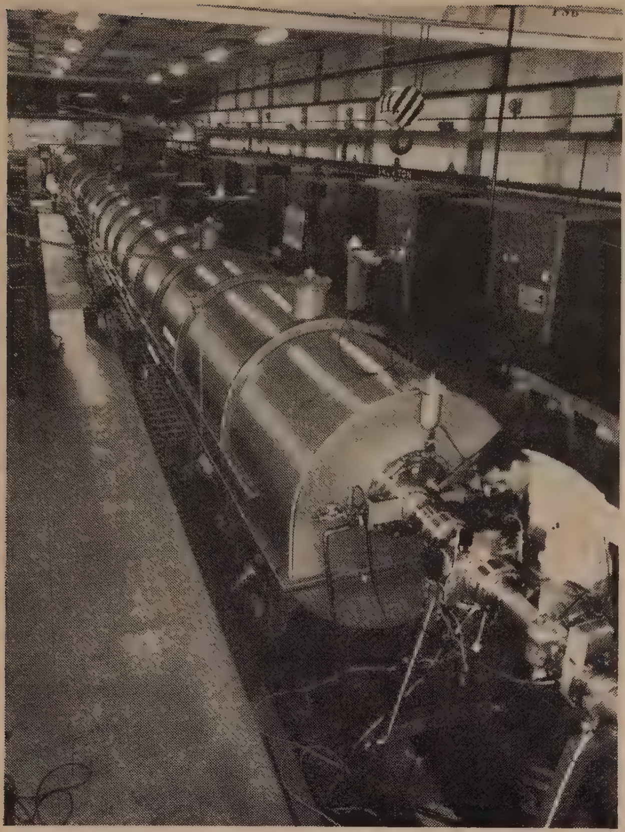


Fig. 3.—50 MeV linear accelerator

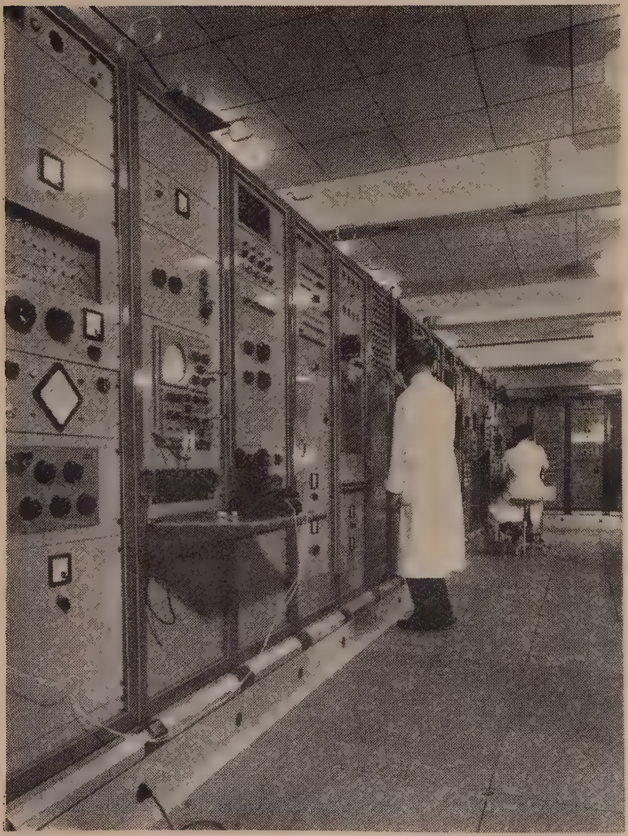


Fig. 4.—Part of the electronic control system

step came in 1950, when a committee of consultants was set up by UNESCO, and at this stage the important decision was taken to concentrate on pure research in physics. By the time CERN was formally constituted in October, 1954, not only had the outline plans for the two accelerators been prepared and the site at Meyrin secured, but construction work had started. Early in 1958 the 600 MeV synchrocyclotron was brought into commission and by the summer of the same year had made its first contribution to research. The 25 GeV machine was envisaged from the beginning as a machine that would provide particles in the highest range of energies apart from cosmic radiation particles.

The total cost to date, largely capital expenditure, is around £20 million, of which Great Britain has contributed 25 per cent and France 22 per cent. The other members, who contribute lesser amounts, also in proportion to their national incomes, are Austria, Belgium, Denmark, West Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland and Yugoslavia. The annual budget is about £5 million, and the staff, who are drawn from all member countries, will, by the end of this year, number nearly a thousand. Both on its council and among the staff there is a heartening atmosphere of enthusiasm and a singular freedom from political difficulties.

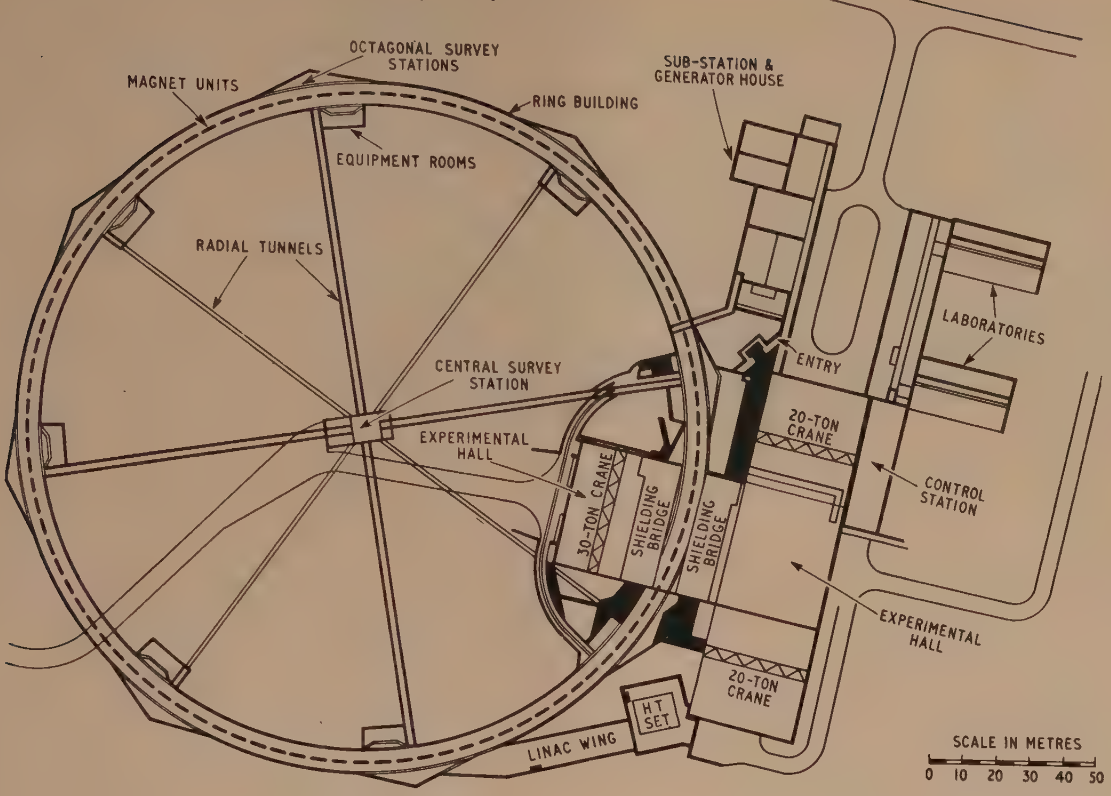
New Principle

A proton synchrotron is so designed that the particles follow a circular path of as nearly as possible constant radius during all stages of acceleration. The size of the constraining magnet necessary, and hence its cost, are much reduced compared with a synchrocyclotron. The special feature of the CERN machine, and of that nearing completion at Brookhaven Laboratory, is the use of the alternating gradient principle. This enables a much more narrowly defined orbit to be used, so further reducing the weight of the magnet required in relation to the energy reached by the particles. Another advantage of the alternating gradient principle is that the amplitude of momentum oscillations, which result in radial movements of the particles, is much reduced.

But these advantages are gained at the price of greatly increased accuracy of manufacture, operation and stability of construction. In the CERN machine each proton must be accelerated over a distance comparable with that between the earth and the moon, until at the end it is travelling at a velocity insignificantly different from that of light. At no time must it depart by as much as a centimetre from its predetermined path, and the whole process must be completed in about a second. How the need for such a formidable degree of accuracy affected the design of the magnets, the r.f. accelerators and power supply system is discussed later, but it can perhaps initially be best appreciated by considering the precision with which the magnets were aligned and the steps taken to ensure their stability.

As can be seen from Fig. 5, the CERN proton synchrotron takes the form of an annular magnet, 200 m in diameter, composed of 100 separate magnet units. The total weight of steel is 3,400 tons. If the magnets are misaligned by no more than ±0·6 mm the peak closed orbit deviation of the proton beam will reach 1 cm. In fact, the magnets have been aligned to an accuracy of

Fig. 5.—Plan of the proton synchrotron



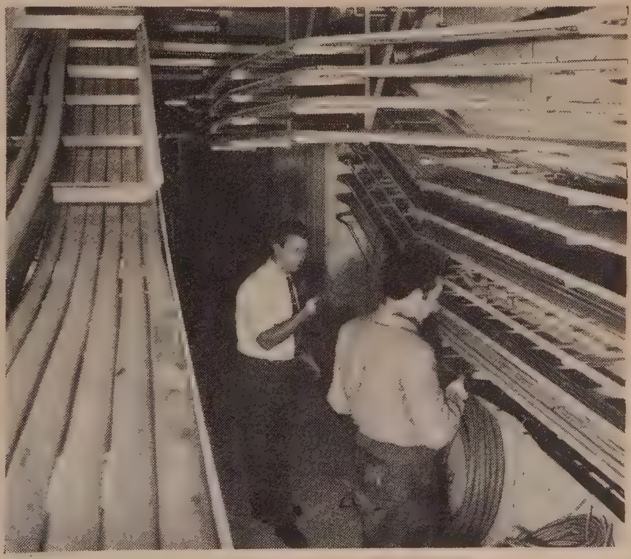
one part in a million, which is just feasible using the best modern theodolites and suitably aged invar wires. From the point of view of the stability of the foundations, it is better to consider the spatial harmonics of the possible distortions. For though a second space harmonic amplitude of 3·8 cm would give a closed orbit of 1 cm, this would be achieved by an amplitude of only 0·36 mm in the sixth space harmonic. To obtain the necessary stability, the magnet blocks are mounted on a free-floating concrete "ring," 2 m square, which is supported through flexible couplings by 80 concrete piles (Fig. 2). These go as deep as 9·5 m into the ground bed rock because the superficial layer of moraine is not sufficiently stable. As a further precaution the concrete ring contains water pipes to maintain an even temperature throughout. The tunnel itself is built below ground and the temperature is controlled to within 1°C.

Magnet Design

The magnet units are divided equally into focusing and detecting sections, rigidly joined together, and each half consists of five adjacent C-shaped magnet blocks 42 cm long. In order to avoid field distortions due to eddy currents, the blocks are made from laminations 1·5 mm thick. For proper operation of the synchrotron it is essential that the magnetic field at corresponding points of the magnetic units should be the same to one part in a thousand. It was also necessary to reduce the effects of uneven magnetic ageing. This was achieved by first ensuring careful control of the chemical composition of the steel and selection of the best ingots and, second, by arranging for each block to be constructed from laminations coming from each batch of steel and not just a part of it. It involved, however, the mixing of some 264,000 laminations.

Each magnet has a double coil of five turns of hollow aluminium conductor wound round each pole piece. Cooling water is circulated through the conductors, and the 400 coils of the complete magnet are connected in parallel for cooling purposes and in series electrically. The coils are insulated by a paper-mica-paper sandwich, vacuum impregnated with a polyester resin. The vacuum chamber in which the protons are accelerated is situated between the pole pieces and consists of a stainless steel tube 7 by 14 cm in cross-section with walls 2 mm thick.

Fig. 6.—The intricate cable trunking system incorporates some 3,600 km of cable



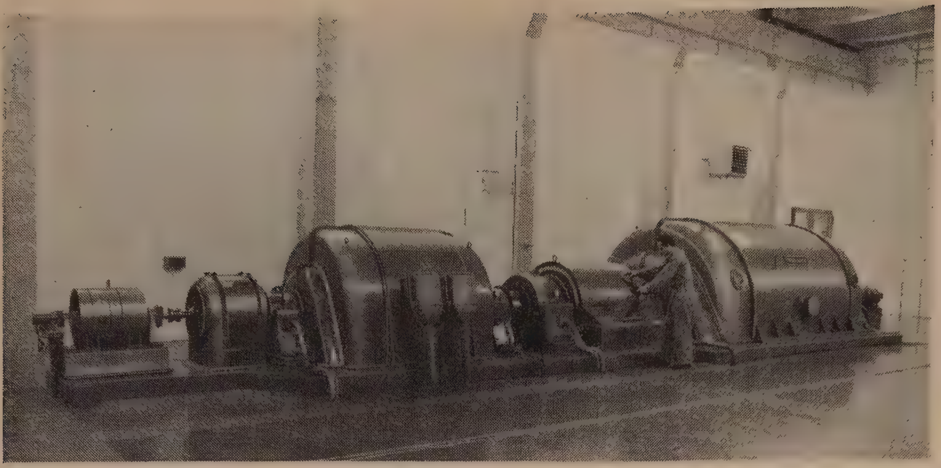


Fig. 7.—The 3,000 r.p.m. motor-generator set showing, right to left: three-phase synchronous alternator, flywheel with emergency brake, three-phase induction motor, slip-ring cover, frequency convertor

The vacuum of better than 10^{-5} mm Hg is maintained by 66 pumps spaced around the circumference.

R.F. Accelerating Units

The magnet units are separated by field-free sectors in which are placed at various intervals ten quadrapole magnetic lenses for linear control; twenty pairs of sextupole and octupole lenses for non-linear control; and sixteen r.f. accelerating stations. These stations each consist of a resonator with an accelerating gap; an automatic frequency tuning device; and a power amplifier. To reduce length the cavity is loaded with ferrite, which also permits the automatic frequency tuning.

The main difficulty in designing an r.f. system to accelerate the protons lies in the fact that it is necessary to ensure perfect synchronism between the motion of the particles, as conditioned by the instantaneous value of the magnetic field, and the frequency of the accelerating voltage. The accuracy required is of the order of 0·1 per cent at injection and 0·01 per cent at ejection, but in the neighbourhood of the transition energy, where the phase jump occurs, the tolerance for frequency deviations is of the order of 0·0001 per cent.

An analogue computer is used for the precise measurement of the instantaneous magnetic field, using the Hall effect and taking account of the influence of the remanent field. The signal thus obtained is injected into another component of the computer, which converts it into a signal corresponding to the frequency-field law. The output signal of the computer then acts on the main f.m. oscillator. The r.f. signal thus obtained is then injected, after adequate pre-amplification, into the distributing amplifier placed at the centre of the machine, and from this cables of equal electrical length transmit the r.f. voltage to the sixteen accelerating stations. This system works satisfactorily at low energies, but at higher energies another system, using the beam of particles itself, is automatically switched in to supplement the analogue computer. In principle, this consists of pick-up electrodes which detect any shift in the radial position of the circulating bunches of particles, and the output from the electrodes is fed into the computer as an error signal to correct the accelerating voltage frequency. In practice the whole system is extremely complex, involving many servo-loops using not only beam shift as an error signal, but also the relative phase of the beam bunches and the applied r.f. voltage.

Both the computer and beam control system have proved satisfactory after minor adjustments and preliminary measurements indicated that the beam was not moving more than 1 cm from the centre of the vacuum chamber during the acceleration cycle.

Protons produced from atoms of hydrogen gas in an ion source are accelerated up to 500 keV in a Cockcroft-Walton generator and then injected into an Alvarez type linear accelerator (Linac) which takes them up to a kinetic energy of 50 MeV. They are deflected into the vacuum chamber of the synchrotron during a period of six microseconds which corresponds to a single turn of the beam. The protons need a flux density of 150 gauss at the start of the acceleration process and the maximum field is 14,000 gauss. During the acceleration cycle (which lasts about one second) the protons make 480,000 circuits of the vacuum chamber, and when it is finished the velocity of the particles reached 99·94 per cent of the speed of light and the energy is about 25 GeV.

The beam can be made to strike a target in the vacuum chamber itself, or, when more complicated equipment is needed for studying the results, the beam is directed through an adjustable baryte concrete shielding wall into one of the experimental halls. At 25 GeV the yield of secondary particles from internal targets is considerably higher than 6 to 10 GeV, and early measurements have indicated that from this point of view this machine may be a strong competitor to the lower energy high intensity machines now being built.

Power Supplies

The operating requirements demand that the magnet current must be raised from zero to 6·4 kA in 1·1 sec and reduced back to zero in 1 sec, during which time the magnet voltage must be kept constant to within 0·2 per cent. It is also necessary that the discharge energy should be stored to avoid losses and disturbances to the public power supply. In the solution adopted energy is stored in a 6 ton flywheel on the shaft of a motor-generator set (Fig. 7). The 38·4 MW peak power from the alternator is supplied to the magnets through a pair of transformers and a group of 24 mercury-arc mutators. These have separate grid control for rectifier and invertor operations, and the change-over is effected electronically. Because of the strict stipulations regarding harmonics, grid control could not be used for controlling the output voltage and instead this is done by varying the excitation of the alternator. Excitation current is supplied by two pumpless steel rectifiers. The speed of the driving motor is governed by an electronically-controlled Scherbius set. This enables the motor to maintain the input power almost constant at 2·6 MW during the pulse programme and prevents the load surges having any repercussions on the supply network. The Scherbius set and induction motor are fed from intermediate 6 kV busbars connected to the 18 kV public supply. In 1960 the total power consumption of CERN is expected to reach 40 million kWh.

Apart from the work of the international design and construction team under Mr. J. B. Adams (who is to return to the Atomic Energy Authority later this year to take charge of the thermonuclear research laboratory at Culham), a striking feature of the CERN proton synchrotron is that calculations on electronic computers have been carried out in several countries, and that manufacturing development and fabrication have been carried out in factories all over Europe. Metropolitan-Vickers supplied the Linac accelerating structure and vacuum system and the English Electric Co. the valves and accessories for the accelerating stations. The machine is fully described in a series of reports being issued by CERN and the June, 1959, number of the *Brown Boveri Review* is devoted to a full account of the power supply system.

ELECTRICITY SUPPLY IN SWEDEN

To mark its jubilee the Swedish State Power Board (Vattenfall) has published an illustrated brochure of 22 pages summarising its progress from 1909 onwards, and forecasting future developments. It is stated that since 1939 the Board's generating capacity, almost all hydro-electric, has risen from about 580 to 3,000 MW and it now produces 46 per cent of the kWh sold in the country, the rest being supplied mainly by power companies and municipalities which, with the Board, co-operate under a Central Co-ordinating Management. Recent technical advances in civil engineering have permitted considerable increases in the capacity of both power stations and individual generating units, notably those at Harspranget (330 MW commissioned in 1952) and Stornorrfors (375 MW in 1959) with sets of 110 and 125 MW.

Transmission at 400 kV

Approximately 75 per cent of the output of the large water power stations in the Norrland is transmitted to the industrial south at 220 kV and by the more recent (1952) pioneer 400 kV system. The latter now consists of 3,200 km of overhead lines associated with 3,250 MVA of step-down transformers, which includes units of up to 585 MVA; one of 1,000 MVA is to be put into service next year.

These high-voltage developments have been accompanied by corresponding expansion of lower-voltage distribution networks and today 99 per cent of all households are electrified with an average annual consumption in 1957 of 1,500 kWh each. Especial attention has of late been paid to rural areas having regard, as a short-term measure, to social policy rather than to economic considerations.

Turning to arrangements for the future, the Vattenfall undertaking is providing for a 50 per cent increase (6,700 million kWh) in output between 1959 and 1963, after which installed capacity is to be increased by 250 MW for each year for a few years, chiefly on Lule River sites. Early in the 1970's, the number of waterfalls still worth developing is expected to be limited, but by that time nuclear power stations of 200 to 300 MW might compete in economy with the less advantageously situated waterfalls, though a 100 MW nuclear plant would probably be needed by the middle of the 1960's. Hitherto, studies have been concentrated on the use of Swedish resources of natural uranium for fuelling reactors with heavy water as both moderator and coolant. It is noted, however, that reactors of other types can, on account of the importance of the time element, be purchased from Great Britain and the United States.

Conventional thermal power stations have not so far played a significant part in Vattenfall operations as they are required to supplement water power only to the extent of about 2 per cent in normal years, and up to 10 per cent in dry years. They have, therefore, been designed with a view to low capital costs rather than fuel economy, but if consumption of electricity continues to increase at the average rate of the last few years (about 7·5 per cent per annum) the need for thermal stations will increase rapidly. Last year saw the completion of a 150 MW steam set and a second is being built, to be followed later by two of 200 MW. A 40 MW gas turbine was brought into service last year and, if it proves satisfactory, will no doubt be the precursor of other and perhaps larger generating units of this type.

A scheme to extend the close co-operation between Swedish power undertakings to cover all the Nordic countries is now being worked out. Greater use has been made of a link with Denmark, established 40 years ago, and in 1958 Sweden exported 560 million kWh to some of the islands of its neighbour. Last April a 220 kV trunk main was run to connect up with the h.v. system of Finland. By next year two lines to Norway are expected to be completed—one at 220 kV to Trondheim and the other at 130 kV to the Narvik district. Later prospects are further trunk connections to South-East Norway and to Funen and Jutland in Denmark. A project under a three-year investigation envisages a connection between Lake Torne in Sweden and Ronbaksfjordan Bay in Norway; this scheme is based on the concentration of most of the hydro resources of the Kalin and Torne rivers in one power station capable of producing 5,000 million to 7,000 million kWh annually.

Floor Warming Course

A course of seven special evening lectures on "Electric Floor Warming and Heat Storage" is to be given at the Twickenham Technical College, starting on Monday, 25th April. The course will cover design of floor warming systems, types of system, their control, floor materials, thermal storage heaters and thermal water storage and electricity tariffs.

E.D.A. Sales Conference

SUMMARY OF PAPERS PRESENTED AT HARROGATE

DELEGATES from the Area Electricity Boards have this week been attending the 23rd annual Sales Conference of the British Electrical Development Association at the Royal Hall, Harrogate. By invitation of the Mayor and Corporation of Harrogate, a civic reception and concert was held on Monday evening. The conference was formally opened on Tuesday morning with an address by Mr. T. E. Daniel, chairman of the E.D.A. Council and chairman of the North Western Electricity Board, after which Mr. J. I. Bernard (director of E.D.A.) reviewed the Association's activities in 1959-60 and outlined the E.D.A. advertising campaigns.

Display and Publicity

Mr. D. B. Irving (chairman, London Electricity Board) presided at the afternoon session when papers with the theme of display and publicity were read.

The first paper, "Selling Through Display—An Outside View," was presented by Mr. Arthur J. Symes (vice-president, British Display Society). Display, he said, was a serious business operation which required the attention of the specialist. He doubted, however, whether such specialists existed in the service centre or the district office. The attitude of the commercial officer to display was not invariably the right one as he seldom knew as much about the means as he did about the end. Nevertheless, he was likely to be keenly conscious of the direct commercial advantages of good display and appreciated its role in the studied process of sales persuasion which today had the name of merchandising.

The main function of the 1,355 service centre displays was to sell equipment, said Mr. Symes, but it was the manner in which the equipment was handled and the framework in which it was seen that made the whole picture of electricity service meaningful and brought it home in human, practical and economic forms. He described the variation in form and style of the service centres that he had seen, remarking that only a few architects were at their best when designing a building to be used as a shop. Showrooms being constructed, though excellent in many respects, would be considered by experienced display executives to be quite out-dated and unsuitable for the job.

He thought it was a mistake to invest too much money in heavy counters, cabinets and other permanent fittings. Instead he would like to see more adaptable display equipment purchased, which, on the whole, the service centres seemed to lack. He advocated the use of the open-back window, pointing out that in this way much greater public interest in internal activity was created—good for both prestige and trade.

On the question of lighting, he observed that whereas the purely functional aspects of illumination were well understood, there was a lack of adventure in using directional lighting for display work. More too could be done with actual lighting fittings for sale. To sell lamps and fittings, he said, was one way of attracting the buying public at large instead of selling to part of them.

The author then went on to say that despite all the technical considerations, display for electricity service centres was still largely a human problem. In every Board area the appointment of a display manager or area display officer would seem to be justified. He would have to be a good organiser and a diplomat and should have a display workshop at his disposal. The speaker then dealt with the question of staff training for display work and finally outlined details of display competitions.

Boards' Showrooms

In his paper "The Place of Display in Electricity Board Publicity," Mr. C. H. Hardie (Eastern Electricity Board) referred to the increased competition which the Boards were now experiencing in the sale of electrical appliances and indicated that the signs were that the competition would become still fiercer. In order to prevent this threat to the electricity showrooms' sales, he put forward a number of suggestions to improve showroom display and also stressed the importance of publicity. As the number and scope of electrical appliances increased, so the popularity of electricity grew, said Mr. Hardie, and appliance sales became a profitable part of an electricity undertaking. The demand for electrical appliances was greater today than it had ever been and the electricity supply industry in England and Wales, with over 1,100 showrooms, had, in 1958-59, a sales and contracting turnover of over £56 million and a surplus of over £3½ million. Appliance sales alone grossed over £38 million.

Far from being just a means of familiarising the public with the benefits of electricity, showrooms now made a substantial contribution to the prosperity of the industry. But in spite of the financial success of showroom operations, particularly during the last two years, in his opinion there was little doubt that the greater majority of showroom premises were today out of date in design, layout and decorative finish.

The author advocated modern and brightly lit exteriors to attract the public and an interior standard of decoration that would provide the right atmosphere in which prospective customers could inspect appliances and make their choice. Money must be spent to preserve and improve what might otherwise be a diminishing asset.

Mr. Hardie suggested ways and means to add interest to displays and stressed the importance of adapting sales methods to the modern tempo. There was, he said, big money in the sale of domestic electrical appliances today and any delay in putting the house in order was going to lose a part of the share in the appliance market which was now enjoyed. The potential market was enormous, but to remain the leaders in the electrical retail business, Boards' selling premises must be reorganised.

Publicity, he said, was a most important tool in encouraging people to "Get up to date—Go electric," but full publicity value could only be obtained if advertising media used were intelligently co-ordinated. He stressed the value of repetition. Showroom display had tended always to be the Cinderella of advertising. To achieve good results required training in the basic skills of display technique. He then outlined a scheme, the salient points of which were that all showroom window displays should be changed every two or three weeks and that they should tie in with major advertising. Use should be made of basic display equipment.

The author concluded by saying that early action was absolutely imperative, and warned that once sales business went to other outlets, it would be hard indeed to get it back.

Selling Electric Cookers

Mr. H. D. B. Wood (deputy chairman, Eastern Electricity Board) presided at Wednesday morning's session, when a paper prepared by Messrs. P. S. Grant and C. G. Agg (South Western Electricity Board) on the practical aspects of selling domestic electric cookers was presented. The background work, such as organisation, advertising and training of staff was first dealt with. There were, stated the authors, certain essentials for the successful selling of any retail product, and they all applied to selling electric cookers. Twice as many new gas cookers were being sold as electric cookers and this was deferring the sales of electric cookers for some years. Under these conditions, modern selling methods were essential: good advertising with adequate impact, modern showrooms and displays, well-trained sales staff, etc.

It was important that the market should be studied. The market for the development of electric cooking, represented by the number of consumers using other means, was indicated in the 1955 Sample Survey of Domestic Consumers. The total saturation then was 24·5 per cent and a year later it was estimated to be 25·6 per cent. Although there had been a great upsurge in the sales of electric cookers since October, 1958, sales of new gas cookers had increased also. A much greater effort was needed if the sale of electric cookers was to be increased at a satisfactory rate. In deciding the scale of this effort, account must be taken not only of the industry's publicity resources, but also of the availability of capital for overall system reinforcement.

In another section of the paper the improvements in the design and performance of electric cookers in recent years were dealt with. There was, it was said, little doubt that their increasing popularity had been largely due to the bigger ovens, faster boiling plates, and automatic features of modern cookers. Advances in design have been greater since the war than in the preceding 25 years.

On the question of sales outlets, it was stated that until recently only a comparatively small proportion of cookers was sold other than by Electricity Boards. It would, however, now be noticeable that increasing numbers of electrical contractors were including cookers in their stock, sometimes quite a large range, and department stores were also showing very much more interest. Before long, sales by dealers and shops might become considerable—the reward of the long-sustained effort to popularise electric cooking by the Boards, E.D.A. and manufacturers.

Dealing with the role of the demonstrator, it was said that this was quite different today than in pre-war years. No longer was there the need to convince the public that cooking by electricity was possible—the task now was to convince them that it was preferable. The electric cooker still needed to be demonstrated but it was best shown either in the window or on the floor of the service centre. Contact with education authorities was also becoming increasingly important.

The organisation for the sale of cookers should be looked into, as well as the question of purchasing and stocking.

Importance of Good Design

The session on Wednesday afternoon, under the chairmanship of Mr. G. N. Green (deputy chairman, North Eastern Electricity Board), was devoted to two papers dealing with design as a factor in increasing sales. The first speaker, Mr. Paul Reilly (chairman, Council of Industrial Design), in his paper, "Design Policy in Industry," said that he was inclined to put much of the blame for the widespread continuation of low standards on the salesman or more justly on the salesman's conception of what the public wanted. He was not prepared to blame it all on the public, as there was a good deal of evidence that the public would accept better things than it had so far been given. A better case could be made out against the trade buyer, because what he bought the manufacturers would make and what he offered the public must accept. It was in industry's interest to keep in touch with the imaginative and inventive ideas of creative designers and architects, just as they kept in touch with technical developments and new methods of accounting and advertising.

But to be successful, Mr. Reilly emphasised, a design policy must start and be maintained at board level. It must run through the organisation and must be seen to do so. The reasons for and the objectives of the design policy should be as clear to those who worked inside as it should be to the customers outside. There could be no half measures about design and in the last resort it was a matter of conscience and conviction. The success of the Design Centre, which after four years maintained a daily attendance of over 2,200, was a strong indication of the appeal of good design. A large proportion of those who attended were young and in the middle income groups. There were many other indications of a much closer interest in the design of things and towards greater discrimination in buying, apart from the many examples of firms who had since the war radically overhauled their design policies. Commonsense and intelligence made visible, he said, might well become the accepted mark of good design in the coming decade.

Guiding the Buyer

The second speaker, Mr. D. Keir (North of Scotland Hydro-Electric Board), also referred to the growing public appreciation of, and desire for, well-designed electrical products. Good design in the expanding market was a very important sales force, and worthy of their fullest attention. They could not, however, be blind to the fact that there was a ready market for domestic electrical appliances of bad design, and Mr. Keir was particularly critical of electric fires that imitated other forms of fuel. In electricity showrooms prominence should be given to those appliances which combined a sound performance with a pleasing exterior. Mr. Keir expressed concern at the large number of foreign appliances being brought into the country, and he particularly regretted that some British manufacturers instead of forging ahead with the development of their own products to meet this challenge were themselves marketing foreign goods.

After reviewing at some length some of the design features which had been introduced by British manufacturers, Mr. Keir warned his audience that much of the benefit of these would be lost if showroom staff lacked technical knowledge of manufacturers' products and appreciation of how "eye-appeal" could assist their sale. Lectures on the functional and æsthetic design of appliances should be included in the Boards' sales training courses, and the E.D.A. could give a lead by including the subject in their salesmanship correspondence course. Lectures to staff by practising designers would also be beneficial and help to silence unjust criticisms.

If well designed a product could help in creating a feeling of goodwill between the industry and its customers. For the future of their sales the Boards should look towards the young married woman. If she bought something that was going to give her years of trouble-free service, they could assume that they would have a customer for many years to come.

After stressing the importance of good design permeating all Board activities that touched the public, from exhibitions to letter headings, Mr. Keir said that the Boards were in a unique position to promote the wider production of good first-rate designs. With their encouragement the public could contribute by adopting a more critical attitude to what they spent their money on in electricity showrooms. The staff could assist manufacturers by passing back consumer reactions to their products.

Electric Floor Warming

Sir John Pickles (chairman, South of Scotland Electricity Board) was in the chair on Thursday morning when Mr. Leslie Shepherd (Eastern Electricity Board) spoke on "Problems in the Design and Installation of Electric Floor Warming Systems."

Although in recent years electric floor warming had been developed with considerable vigour, there had been considerable scepticism (and indeed downright opposition) on the part of the heating and ventilating profession and trade. This, Mr. Shepherd suggested, might be due in some measure to the very enthusiasm of many protagonists for electric floor warming. Design methods had sometimes been suspect or misunderstood with the result that rash claims verging on the impossible had been made, and he sympathised with the genuine investigator who found that floor warming apparently did not obey the accepted physical laws of space heating. Nevertheless, electric floor warming worked well; but it must also be seen to be based on sound, logical physical and engineering principles.

The proved success of off-peak electric floor warming had at last persuaded heating engineers in general that it was a legitimate method of space heating. If the electricity supply industry was to keep the initiative and develop floor warming on the most suitable lines, and at the same time merit the confidence and co-operation of the heating profession, it must squarely face the technical and practical problems involved, provide (or assist in providing) solutions to them, and show that installations were based on sound design.

Mr. Shepherd then went on to highlight some of the problems and suggest possible solutions. He mentioned in particular the work of the committee set up last year by the Heating and Ventilating Research Association and the space heating design panel of the E.D.A. which were working to achieve a simpler and standard method of electric floor warming design. As an extreme example of what might occur, Mr. Shepherd said that with a solid concrete suspended floor without any thermal insulation nearly two-thirds of the heat would travel downwards if a fitted carpet and underfelt were placed directly on the surface of the screed. Even with some types of insulation half the heat would still in similar circumstances flow downward. Ideally, control thermostats should take account of changes in outside temperature, otherwise the use of a "topping-up" source might reduce the charging period and adequate heat would not then be available the following day.

It was important, Mr. Shepherd concluded, that the man in the field should have the fullest knowledge of the subject. Above all the District man must have behind him an organisation to which he can refer when an unfamiliar problem arose. If the people in the District believed in floor heating, knew what it could do and what it could not, and themselves had confidence in it, floor warming would continue to contribute an ever-increasing part to the development of off-peak loads.

Profitable Retailing

The problems in obtaining adequate profits from retail trading were set out by Mr. J. P. Montgomery (Midlands Electricity Board) in his paper, "Profitable Practice in Retailing," read at the Thursday afternoon session. Mr. D. Bellamy (chairman, Yorkshire Electricity Board) presided. Mr. Montgomery said that, since nationalisation, the Boards had been highly successful in selling and installing many thousands of different appliances and important new uses had been promoted, all of which had helped to bring about a more diversified demand and had contributed substantially to the doubling of domestic consumption in the period.

But despite the achievements, the financial aspects of the Boards' trading had been subjected to unfavourable comment, particularly in the Herbert Committee Report, which criticised the low profits and allegedly unbusinesslike practices. In eleven years trading turnover totalled some £385 million but the surplus earned was only £15 million, or less than a 4 per cent return.

The criticisms might have influenced the more realistic approach by the Boards to trading profitability, which had emerged in the past year or two, said Mr. Montgomery. But the changed attitude might have been influenced by the desire to finance a larger proportion of future capital requirements out of revenue. Although trading profits were unlikely to affect the capital position substantially, they could be significant in helping out with revenue account costs. The old argument that electrical development and trading profits were incompatible was no longer valid, he said.

The author, in examining the problems, said that the three main variables which had a bearing on sales performance were (1) the state of the markets, (2) the quality of the sales practice, and (3) the attitude towards selling. After dealing with these in detail, he spoke of planning for profit. A worthwhile trading surplus for each Board to aim for would probably be not less than 8 per cent, provided always that the turn-round of the working capital employed was, say, 4 or 5 times per annum. The overall gross profit margin should be something of the order of 24 per cent.

Referring to the use of publicity in the selling plan, the author said that publicity expenditure by the Boards last year (1958-59) was just over £1,280,000, but only about 20 per cent of this was a trading expense, the remainder being allocated to consumer service. The Electricity Boards appeared to spend much less on publicity than the Gas Boards.

A number of manufacturers who previously made only gas appliances were now producing for the electrical market—a strong enough indication of the way the wind was blowing. If the Boards were to benefit fully from the expansions which were taking place, their retailing organisations would require to be conducted with maximum efficiency, otherwise manufacturers would be forced to distribute a larger proportion of their increased productions through other channels.

E.C.A. Conference

THE provisional programme for the annual conference of the Electrical Contractors' Association and its allied organisations has been issued. This year's venue is Scarborough and the period from 19th to 21st June. In accordance with custom, after registration on the first day (Sunday) there will be a "Get Together" in the evening. Monday's proceedings will open with a civic welcome and after the presidential address, by Mr. V. J. Stock, the annual general meeting will follow. A social function will take place in the afternoon and in the evening there will be a reception and dance at the invitation of the Mayor of Scarborough.

Two papers will be read on the Tuesday, one on "Floor Warming by Electricity" in the morning and the other on "Retailing—the Future Pattern" in the afternoon. The afternoon session will conclude with the installation of the new president, who will deliver a short address. In the evening the president's reception and dance will be held.

COMPUTER DEVELOPMENTS

Summary of the papers concerning digital computer developments at Manchester University presented at a meeting of the Measurement and Control Section of the Institution of Electrical Engineers on 1st March

FOLLOWING an introductory lecture by Dr. T. Kilburn, a paper entitled "A Digital Computer Store with Very Short Read Time" by T. Kilburn, M.A., Ph.D., D.Sc., M.I.E.E., and R. L. Grimsdale, M.Sc., Ph.D., Graduate I.E.E., was read. This paper described the principles of operation and the construction of storage units with a very short access time for reading. One form of the store which had been constructed had a capacity of 200,000 bits of permanent information and another had been built with a capacity of 100,000 bits, the whole contents of which could be changed in under one minute. The technique employed permitted the construction of very large stores at low cost. Each digit cell was formed, basically, by two sets of windings which formed the primary and secondary of a transformer and the two binary states were determined by the presence or absence of a piece of linear ferrite material coupling the windings. The access time was largely determined by the physical size of the store and the speed of operation of the associated circuits; a time of 100 millimicrosec was typical.

The second paper on "High-Speed Light Output Signals from Electroluminescent Storage Systems" was prepared by G. R. Hoffman, Ph.D., B.Sc., D. H. Smith, M.Sc., Ph.D., A.M.I.E.E., and D. C. Jeffreys, M.Sc., Graduate I.E.E. The possibility that a matrix of electroluminescent cells could be used for storage of information in digital form had long been realised. The problems involved in reading information from a simple type of permanent store were discussed. It had been shown that the read-out time was limited by the afterglow of the phosphor and, for a particular phosphor (ZnS, Cu, Cl), it was 25-30 microsec per digit. A theoretical calculation of the discrimination ratio, i.e. the ratio of the output signal from a "1" to the interference signal obtained when a "0" was selected, showed that it should be possible to operate matrices with as many as 64^2 cells. This conclusion was not borne out by measurements made on experimental panels; these suggested that 32^2 was about the maximum. Results obtained in the paper were regarded as preliminary since arbitrary choices had had to be made concerning some aspects of the operation of the matrices. There was little doubt that considerable improvement in performance was possible.

These papers were followed by a contribution by D. B. G. Edwards, Ph.D., M.Sc., A.M.I.E.E., M. J. Lanigan, M.Sc., and T. Kilburn, M.A., D.Sc., Ph.D., M.I.E.E., entitled "Ferrite Magnetic-Core Memory Systems with Rapid Cycle Times." This contribution was concerned with improvements in storage systems using currently available square-loop ferrite cores to reduce the normal cycle time of approximately 6-10 microsec to less than 2 microsec—which was regarded as the maximum permissible cycle time for the main storage requirements of the next generation of high-speed computers.

SCIENCE MUSEUM FUSION APPARATUS

EQUIPMENT used in early work on controlled thermonuclear reactions is being sent on permanent loan to the Science Museum from the Atomic Weapons Research Establishment, Aldermaston. The machine (OSWALD) has been partly dismantled and its components labelled to enable the non-technical visitor to understand how it works. It will be on view in the Science Museum within three or four weeks.

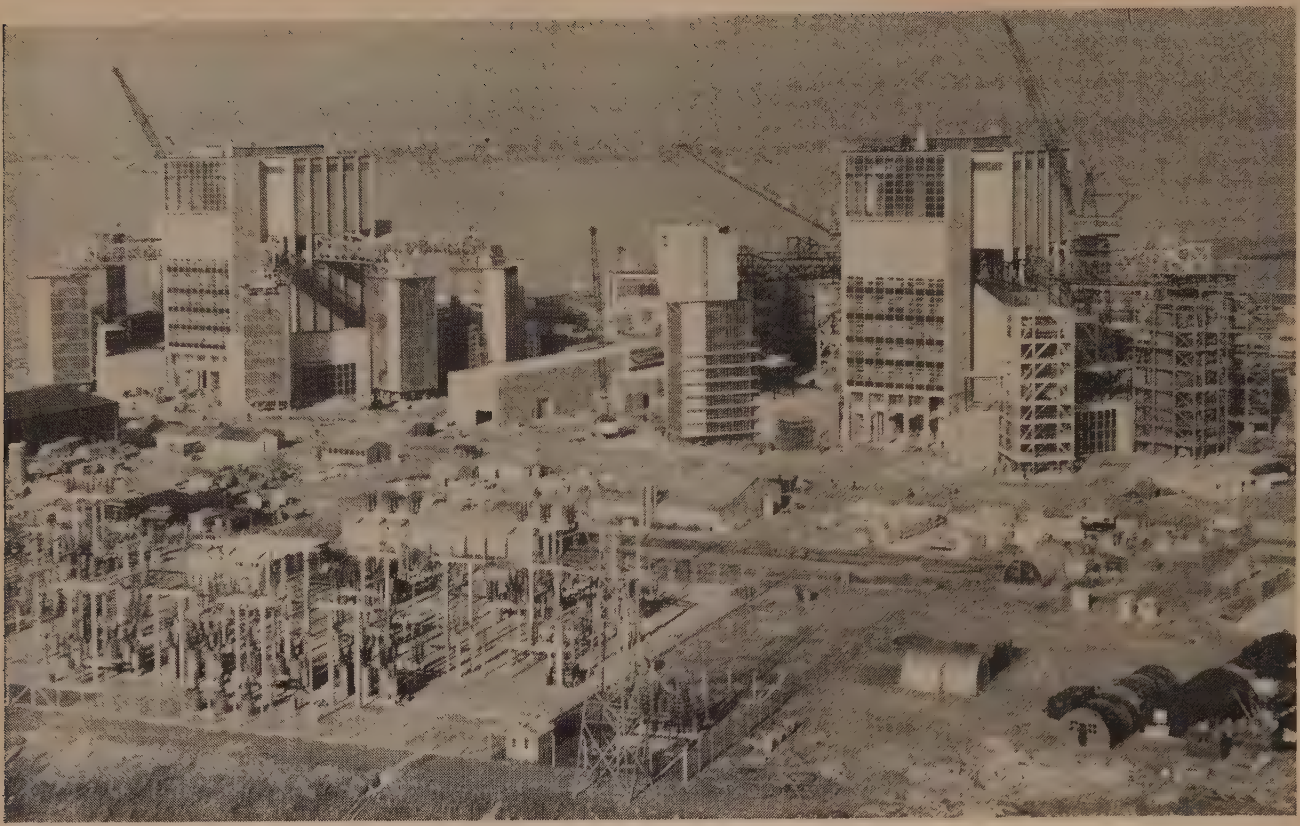
Basically, OSWALD consists of a condenser bank and switchgear capable of delivering an extremely heavy current in a very short time to a straight quartz discharge tube containing a gas under low pressure. The idea was to put electrical energy through the gas in the discharge tube as rapidly as possible so that a temperature of several million degrees could be reached before cooling processes and instabilities could operate. The gas was heated by magnetic compression which required a rapid rate of rise of the current. Condenser banks had hitherto been discharged by a single switch which limited the rate of rise. A considerable experimental advance was made by using 144 spark-gap switches in parallel, all operating within a few thousand millionths of a second.

Neutrons were produced by a gas discharge in OSWALD in February, 1957—the first time this had been achieved in Britain. The temperature reached was estimated to be around one million degrees Centigrade.

The method of obtaining high temperatures pioneered by the designers of OSWALD is known as rapid compression heating. It is now being studied with multi-switch banks in many nuclear research laboratories throughout the world. The largest of these devices in the U.K. is at the Atomic Weapons Research Establishment and is known as MAGGIE. It is capable of providing a current with a rate of rise of five million million amperes per second, or about four times the rate of rise for OSWALD.

Instrument Conferences

The Society of Instrument Technology is arranging a series of one-day conferences, starting in the Bristol area on 22nd March, on "The Value of Instruments and Automatic Control to the Smaller Firm." Particulars can be obtained from the Society at 20, Queen Anne Street, London, W.1.



PROGRESS AT BERKELEY

IT is now just three years since construction work began at Berkeley nuclear power station which is situated on the left bank of the River Severn about 15 miles from Gloucester. Today, the civil engineering work has virtually been finished and the mechanical work is three-quarters complete. The emphasis is now on the reactor installation and it is anticipated that the first of these units will be commissioned in about twelve months' time, and the second about six or nine months later. The power station has been designed and is being constructed by the A.E.I.-John Thompson Nuclear Energy Co., Ltd., for the Central Electricity Generating Board. The civil engineering work in the reactor area has been carried out by John Laing & Son, Ltd., while other work in the "conventional" area is in the hands of Balfour Beatty & Co., Ltd. The power output from the completed station will be nominally 332 MW, of which about 12 per cent will be required to drive the gas circulating turbines and about 4 per cent for other ancillary services at the station. There will be a guaranteed net output to the national grid of 275 MW.

When we visited the site last week, we were able to go inside the pressure vessel of No. 1 reactor to see the work which is being carried out on the construction of the graphite core. Some idea of the clean conditions which are being maintained inside the vessel for this work can be gained from the fact that all workpeople and visitors have to pass through airlocks and then strip down to their underclothes, removing watches, rings, etc. Then they pass into another room where they are equipped with a thick vest to absorb body moisture, a boiler suit, gloves, a hat and soft rubber shoes. This clothing is fastened by means of tapes since even one lost button in the reactor core could have very serious results.

The reactor pressure vessel is a dome-ended cylinder 80ft high by 50ft in diameter and it is fabricated of 3in thick steel which increases to 4in thickness at the gas inlet and outlet ducts; it weighs 1,000 tons and is supported on eighteen "A" frames. After No. 1 pressure vessel had been completed the interior, including the graphite support plates, was scrupulously cleaned. Then the 4in thick graphite support plate area, which contains 3,275 cavities, was divided into quadrants. Beginning with the first quadrant, straight edges were accurately placed to form a right-angle. In this four graphite blocks were placed to act as a locational centre and mounted on a fixed base. Flat movable ball-races were mounted on the adjacent cavities and subsequent blocks married up with the locational blocks.

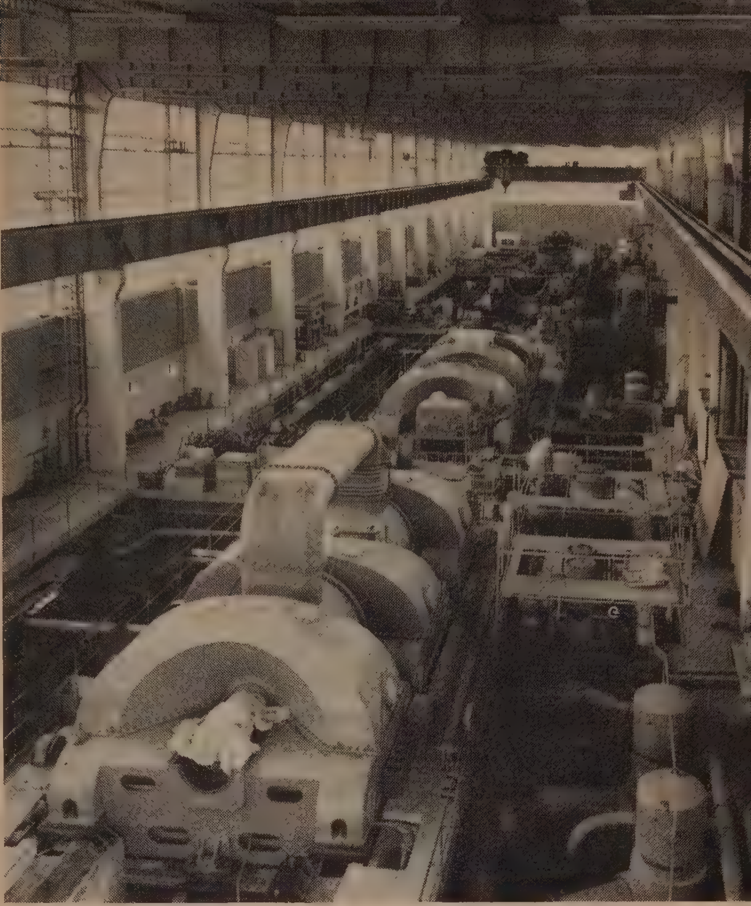
Once the first layer in this quadrant was completed, the straight edges were removed and re-aligned on the second quadrant, so that eventually the whole first layer of the 48ft diameter, 30ft high, 2,000 ton graphite core was laid. Extreme care was necessary in the laying of this first layer, for upon it depended the accurate construction of the core as a whole.

Through the graphite core there are 3,275 channels which will contain 250 tons of natural uranium in the form of rods. There will be 13 rods to each channel. To prevent the escape of radioactive fission products, each rod is canned in a helical finned magnesium alloy container and the complete assembly is called a fuel "cartridge." If the can suffered a minute puncture there would be contamination of the gas circuit. Any continuation of this defect would result in progressive contamination which would interfere with the efficiency of the reactor. It is therefore essential to detect and remove the faulty element.

To detect such a puncture 3,275 stainless steel tubes are passed into the pressure vessel, and the end of each tube is situated near to the outlet of a fuel channel in the graphite. Once every 30 min the carbon dioxide gas passing through a group of four channels is "sniffed" or sampled by the respective tubes and this "sniff" is passed through a burst slug detector valve. This valve can isolate a particular channel from a group of four should a high contamination level be detected.

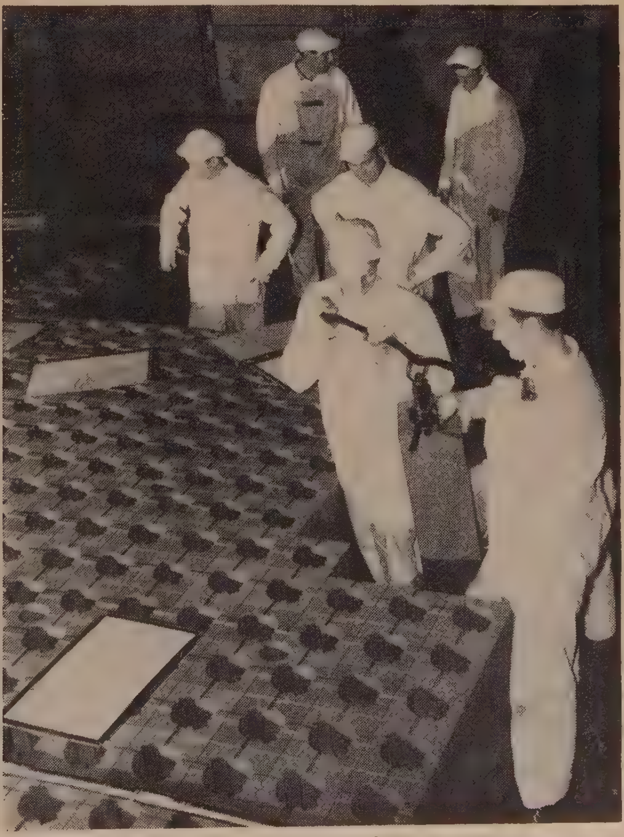
From the burst slug detector valve the CO_2 "sniff" is led to a precipitator which is, basically, a taut rotating wire connected to a high voltage supply, and the "sniff" or gas sample passes over the wire. The high voltage causes contamination products in the gas to be deposited upon the wire. As the wire travels forward any contamination is picked up by a radiation detector, and this information is sent to a central computer system which will cause an audible warning to operate if the contamination level is too high.

The sequence of events, therefore, is that there will be an audible warning, the computer, on detection, will give

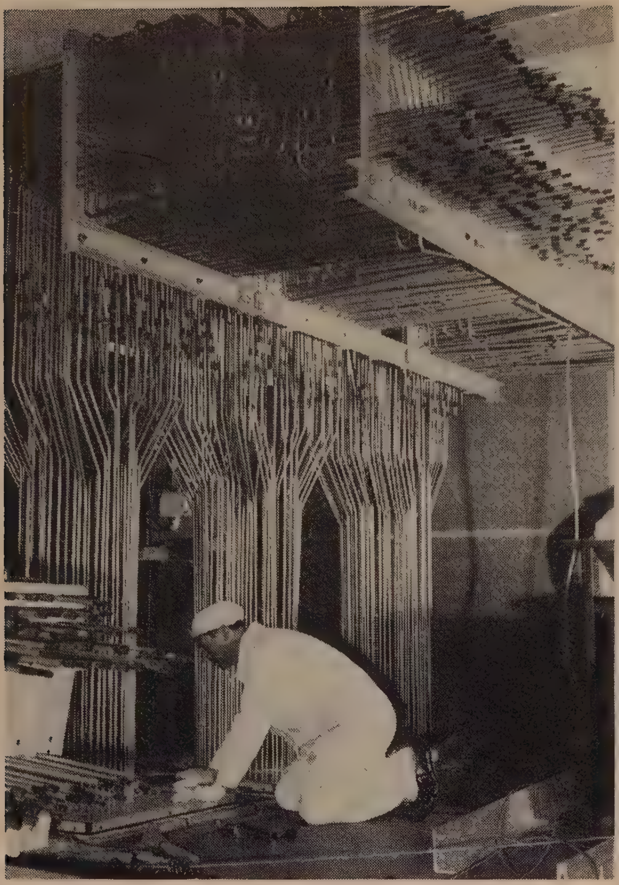


General view of the turbine room at Berkeley

Interior of No. 1 reactor pressure vessel showing the 4in thick steel support plate for the graphite core. The plate has 3,275 holes which locate the fuel channels in the 2,000 ton graphite core



The reactor core is composed of accurately machined graphite blocks



a complete record of the faulty channels, and will indicate in which group of four channels the fault lies. The detector valve will then indicate which one of the four channels is affected, and this information will be passed to the charge face and the cartridges in the faulty channel will be removed and replaced.

The station is controlled from the main control room in the turbine hall and from this point it is possible to override secondary controls in either reactor. Control is exercised by three engineers. In charge is an assistant shift charge engineer seated at a central desk, while in front of him are two operators seated at a large console. The instruments of the console record the operating characteristics of the plant. In front of the console is equipment which controls and monitors for the eight water tube boilers of each reactor.

To the right of the console are the 6·6 kV cabinets which control the supply of ancillary power in the station, and on the left is automatic recording equipment which keeps a constant check on the physical characteristics of the reactor cores.

In the turbine hall, the four 83 MW turbo-generator sets are in the process of being installed. They are laid out in line; No. 1 set is virtually ready, and No. 2 set is two-thirds complete. Both will be driven by No. 1 reactor early in 1961. The third and fourth sets will be driven by No. 2 reactor during the third quarter of 1961.

Some of the 3,275 stainless steel tubes rising up from the burst slug detector valves and precipitators

Engineering and Civilisation

THAT this was an age of increasing and narrowing specialisation and that the engineering institutions had proliferated and fragmented to an untenable degree was maintained by Sir Hugh Beaver, K.B.E., M.I.C.E., M.I.Chem.E., M.E.I.C., in the sixth Graham Clark Lecture which was given to a joint meeting of the Institutions of Civil, Mechanical and Electrical Engineers on 3rd March. The result, he said, must be to weaken, deflect or conceal the conscious influence of the impact of the engineer on society and on civilisation. He defined civilisation as a continuous motion steadily and relentlessly pressing forward all the time. One had to march forward whatever the future, and this applied particularly to the engineer and to the great engineering institutions.

Science and technology had brought us to the very edge of potential world destruction and the world was at a critical point in its history. Engineers had done much to create this situation and they now found themselves faced with the problem of whether they could save it. The problems of education and training of engineers were vitally important not only from the technological point of view but the more profound and difficult question was how we were to produce not only engineers but "civilisers." Engineering had sometimes been looked on as the science or technique of getting machines and instruments to do the job of manual workers, but manpower was the basis of engineering, not the shortage of manpower.

Sir Hugh Beaver then referred to the necessity of broadening engineering and scientific education. He noted that a one-year course had been introduced at Cambridge in the principles of industrial management in which there would be five papers, two of which would be on human behaviour in industry and on the social environment of industry. The Imperial College of Science and Technology and the London School of Economics and Political Science had for some years provided a scheme of joint graduate and post-graduate studies in technology, economics and administration. The course of economics for engineers and applied scientists was intended to provide an introductory knowledge of economics in relation to industry and business organisation for university students who had completed or were in the course of completing their first degree work.

The recent Crowther Report dealt at length with the problems of the production of men and women who could comprehend the impact upon society and the "corollary that scientists and technicians should be exposed to the radiation of humane letters." To enable students of science and technology to acquire a broader education and the attributes of leadership was not a problem for the university alone—it was a general human problem. All the university or college could do was to make a continuous and organised effort to provide facilities whereby a student could broaden his outlook and interests.

Overhead Current Collection

Following the decision of the British Transport Commission to adopt the 25/6·25 kV a.c. overhead system as standard for its electrification projects, it has become necessary to examine in more detail the problem of current collection particularly with the higher speeds proposed under the Modernisation Plan and the lighter equipment used on the a.c. system. This article describes the test equipment employed in connection with this work

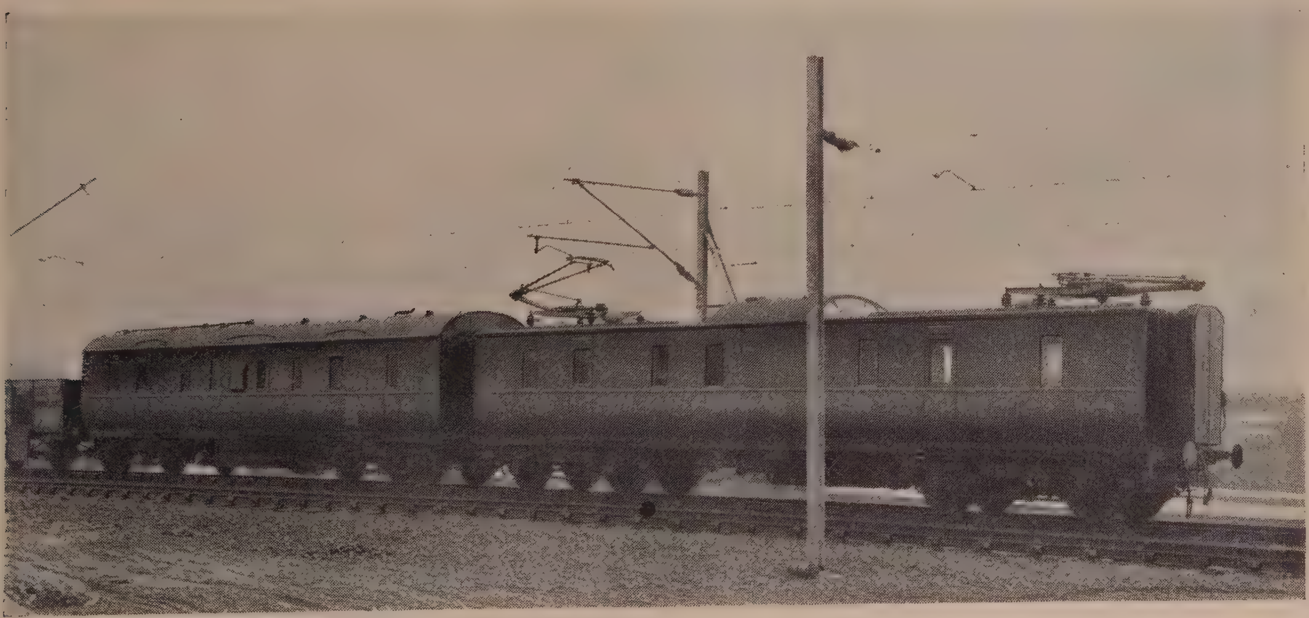
To examine in detail the mechanism of high-voltage a.c. overhead current collection on the London Midland Region of British Railways, where work is in progress on the main lines between Euston, Birmingham, Liverpool and Manchester, a high-speed test unit has been designed and constructed. It can be hauled by either an electric locomotive or a main line diesel locomotive at speeds up to 100 m.p.h., or it can be hauled by a multiple-unit train.

The high-speed test unit consists of two bogie vehicles with corridor connections throughout, one vehicle being the test car and the other a generator and auxiliaries car. The test car has a central dome for visual inspection of the performance of the pantograph in relation to the overhead equipment, one end compartment housing the instrument console and the other end compartment the high-voltage equipment. The dome is equipped with seating facing each way to give a clear view of the pantographs throughout their full working ranges, speed indication, pantograph raising and lowering buttons, event marker buttons and an emergency brake valve. Floodlighting is provided on the roof for use at night and in tunnels.

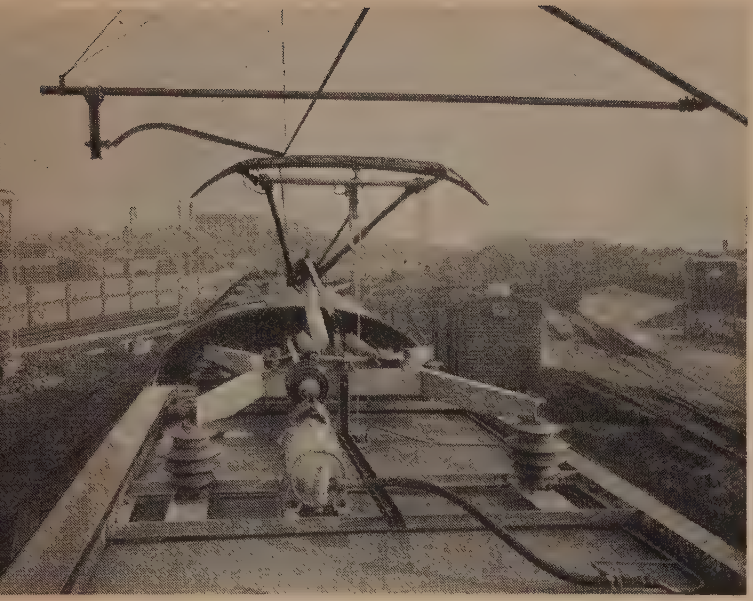
The two low portions of the roof at either side of the dome are each fitted with a Stone Faiveley pantograph type A.M.B.R., suitably modified to include strain gauges, accelerometers, etc., which are operated by compressed air via electro-pneumatic valves controlled from the dome. In the interests of safety, each of the electro-pneumatic valves is capable of being locked in the inoperative position, the keys being held by the person in charge of the car.

The high-voltage compartment, which is also locked for security, contains a porcelain through bushing to bring the live feed into the test car; a measuring device, insulated against 25 kV, to give wire height, pressure and acceleration; a voltage transformer which is used for recording both line volts and contact loss; and two current transformers on the outgoing cable to the locomotive, to cover the range of currents expected from both electric locomotives and multiple-unit trains. Jack-in intercom telephones are provided throughout the test car and also to the locomotive hauling the train.

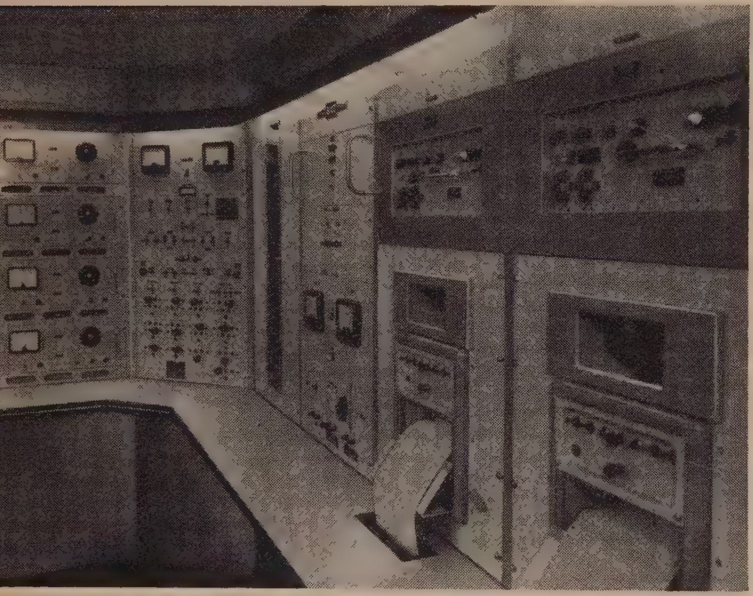
The instrument compartment houses the instrument console which is placed between the floor and roof on resilient mountings. Among the instruments provided there are three two-channel low-speed recorders each with additional facilities for indicating track, time or event markers. Various chart speeds are provided in these recorders. There is also a four-channel high-speed recorder, capable of recording frequencies up to 1,000c/s; two channels are fitted with amplifiers, the other two being available for contact loss, time or event markers.



High-speed test unit for examining the mechanism of current collection with a.c. overhead contact systems



Type A.M.B.R. pantograph with height gauge, strain gauges and accelerometer fitted



Section of the instrument console

Facilities are provided to trigger off this recorder from track markers placed at selected positions on the track to enable a high-speed recording to be taken over a comparatively short section. A low idling speed is provided in this recorder to prepare the inking apparatus prior to a high-speed run.

An interconnector panel is provided to enable any of the quantities to be measured to be recorded on any of the four recorders. This panel consists of a series of plug-in jacks arranged in banks to conform to the recorders and their channels. Also included in this panel are the controls for track mark photo-cell units, velodyne set, etc. The height gauge associated with the "dead" pantograph is on the console and it is arranged for visual observation. It consists of a linear potentiometer with its connection to the pantograph designed to telescope as the range of the pantograph is greater than the headroom of the vehicle. Power packs giving the variable d.c. feeds to the various equipments are grouped together in one section of the panel, while another accommodates the range switches for traction current and voltage recording, these being operated manually when a change of voltage is experienced at a neutral section, i.e. 25 kV to 6·25 kV or vice versa.

When recordings of contact loss are being taken with the "dead" equipment 300 V d.c. is fed into the overhead equipment via the test pantograph. The overhead equipment in this case is earthed, the circuit being completed via the running rails and a limiting resistor. The "dead" pantograph head mechanism has been adapted so as to include between each of the two points of attachment, a strain gauge dynamometer the outputs of which are summated to give pantograph pressure, and on the pantograph head itself, an accelerometer, without increasing the overall weight above that of a standard pantograph head. It is essential that the inertia of the head shall be unaltered to give correct pantograph performance and it has been necessary to use aluminium alloys and plastics.

The generator car has an engine compartment which includes a 12 kW, 230 V, 50 c/s diesel-driven alternator set to provide the power for all the services within the test car and an air compressor and reservoir for pantograph operation. A workshop, a photographic dark room and a guard's compartment are also provided. The test car and the generator car are connected together, access being provided by corridor connections. Electric power, compressed air and 36-way control jumpers are provided between the two cars.

Speed Trials

Runs have been carried out with the test unit on the main line between Crewe and Wilmslow and also on the Styal line at speeds up to 90 m.p.h. Trials have also been carried out throughout a full range of speeds for comparative purposes using a type A.M.B.R. pantograph with its static pressure set at 20 lb. Further investigations are to be carried out with variations in upward pressure and with different pantograph head mechanisms. It can thus be seen that the high-speed test unit will be most useful in developing the design of overhead equipment for high-speed running and for obtaining the best combination of pantograph design, static pressure and overhead equipment design to give the best possible performance.

In addition to its uses in design, this test unit will be used in the future, as the line is commissioned, for detecting sections of the overhead equipment which may deteriorate, so far as current collection is concerned, from time to time due to various causes such as land subsidence, track maintenance, etc. Early detection of such areas can well save considerable expenditure in contact wire renewals. The test unit has been designed to run in service or special trains on complete sections of the line, periodically, to enable recordings to be taken. The results obtained can be analysed and the findings made available to the electric traction engineer responsible for the maintenance of the section of line involved to enable him to carry out the work necessary to rectify any defects.

VIEWS on the NEWS

By REFLECTOR

To many people who are quite incapable of providing for them quarterly electricity bills are burdensome. Suggestions have been made in *Seeboard* (the magazine of the South Eastern Electricity Board) that monthly billing would prove more acceptable and, moreover, lead to greater sales of electricity. Quarterly accounts are alleged to restrict consumption, especially for heating. Mr. E. Sinnott, the Board's chief accountant, in replying to the suggestions, thinks, in the first place, that the need for such a system has not been established. Where there is likelihood of real hardship the prepayment meter is probably the best solution. He also doubts whether there is a real demand for savings stamps or instalment card facilities. The principal argument against monthly billing is the substantial extra expense, which the consumers would have to meet. During the exchanges Jugoslavia was cited as a country which has monthly accounts, but surely the method is also used in the United States quite extensively.

* * *

An article in *Reynolds News* discusses difficulties in arousing the interest of "teenagers" in the usual scholastic subjects and suggests that it would be wiser to concentrate on teaching them about the world in which they live:—

> "One teacher, for example, called in demonstrators from the Electricity Board to show vacuum cleaners, hair dryers, washing machines and cookers to a class of 15-year-old girls. The girls found themselves reading catalogues and instruction sheets and working out complicated sums to compare costs. They demanded to know a bit about how the gadgets worked, although they would have shied away from a physics lesson on applied electricity."

This is somewhat reminiscent of the practical methods of Mr. Wackford Squeers, but it is useful electrical education.

* * *

By no means are all British hotels the dingy, démodé establishments depicted by their critics. Many are bright, convenient and up-to-date, as the one referred to in *Philips Forum* (Philips Electrical, Ltd.). In this, the Pembroke Hotel, Bournemouth, electric blankets have been installed in all of the twenty-six bedrooms. It may not be unique in this respect, but it is probably the only one in which the blankets are centrally controlled. They are connected to a central time-switch which is so set as to put them into circuit from 9 to 11.15 p.m.; each also has its individual switch. Electric blankets give much less trouble than a hot water bottle service and are probably little dearer in the long run.

* * *

"Trawsfynydd Site News," the first issue of which has reached me, is a single sheet presenting a number of interesting items on this North Wales nuclear power station which, when completed, will be the largest of its kind in the world. Work by Atomic Power Constructions, Ltd., who are building the station, started about six months ago and is timed to be completed in 1964. The news-sheet gives the reasons for the construction of the station and deals with the present state of the site. Appropriately, there is a column in the Welsh language, for there are a great many Welshmen employed at Trawsfynydd.

* * *

There has recently been a revival of interest in the electric runabout in the United States. But whatever they produce will not beat the performance of London taxis which have been demonstrated there. Second Lieut. J. M. H. Watling, of R.E.M.E., has called my attention to a *Reuter* note which appeared in the *Evening News* a week or two ago. This said that:—

> "After two weeks, each four-cylinder car, operated by two batteries, has gone about 2,000 miles. This mileage is more than twice that of the gasoline-driven American vehicles."

I don't know quite what it means, but it suggests a very good performance on a single charge by a type of London taxi I have not yet come across.

* * *

Mr. R. P. David, of Enfield, says that while recovering from influenza recently he re-read Conan Doyle's *Hound of the Baskervilles*. He was amused to come across a passage in which Sir Henry Baskerville arrives, with Dr. Watson, at his ancestral home on a gloomy autumn evening (sometime in the 'eighties).

> "Baskerville shuddered as he looked up the long dark drive to where the house glimmered like a ghost at the farther end. . . . 'It's no wonder my uncle felt as if trouble were coming to him in such a place as this,' said he. 'It's enough to scare any man. I'll have a row of electric lamps up here inside of six months and you won't know it again with a thousand-candle-power Swan and Edison right here in front of the hall door.'"

I think that this will serve as this week's glimpse of the past.

Parliamentary Report

Scottish Railway Electrification

In a written reply to a question by Mr. Hector Hughes in the House of Commons last week, the Minister of Transport (Mr. Marples) said that good progress had been made with the electrification of suburban lines in the Clyde Valley around Glasgow. Test running was taking place on a six-mile section of the 51 route miles scheduled for electrification on the north side of the river, and it was expected that the first of the public services would be introduced in 1960. The electrification of a further 19¾ route miles on the south side of the river was also planned.

Nuclear Ships

The Minister of Transport said that he would discuss with shipowners the suggestion that they might form a consortium to own and arrange for the operation of a nuclear powered tanker. Tenders had already been invited for two types of nuclear reactor for a large tanker, and an order for building the tanker would be further considered when these were received. Account would be taken at that stage not only of what the tenders disclosed but of the progress made with other types of reactor which showed promise. The Civil Lord of the Admiralty, Mr. Orr-Ewing, also stated that studies were being made of possible applications of nuclear power to surface warships as well as submarines.

Colour Television

Pointing out that 500,000 colour television sets were estimated to be in use in the United States, Mr. Janner asked the Postmaster General what was stopping the supply of an adequate colour television service in Britain. Mr. Bevins said the main problem—and it was a universal one—was the production of a colour receiver at an economical price. They also had to determine the colour system and the definition standards to be used. The whole matter of line definition and colour was being examined by the Television Advisory Committee, whose report was expected quite soon.

"Satellite" Transmitters

Asked if he would expedite his plans for installing low-power "satellite" transmitters in areas remote from main transmitters in order to improve television reception, Mr. Bevins said the B.B.C. was pressing on as fast as it could, with the television satellite stations announced in June, 1959. It was also preparing its plans for the next stage of its scheme. The I.T.A. was still busy completing its main network stations and had told him that it was not yet in a position to propose plans for smaller stations in areas not adequately served at present.

Missile Warning Station

Giving more details of the Fylingdales ballistic missile warning station during the debate on the Air Estimates, the Secretary of State for Air (Mr. Ward) said the station was a multiple radar of very high power with an effective range of several thousand miles. It would scan a wide arc in space, and would pick up and follow the track of all solid objects that came within its beam. Associated with it were two of the most complex electronic computers ever designed. These computers could distinguish between ballistic missiles and any other objects in space, such as meteors or man-launched satellites. Besides identifying and giving warning of the approach of a ballistic missile, the station would also be able to predict the target which it would hit.

Purchase Tax on Electrical Appliances

Because it is now compulsory to fit guards to all electric fires, Mr. Nabarro asked the Chancellor of the Exchequer if he would free from purchase tax the cost in an electric fire which was attributed to the provision of such guards, but Mr. Amory replied that he would not. Mr. Nabarro also asked why the Chancellor continued to impose a 25 per cent purchase tax on a large range of electrically operated domestic equipment designed to save labour in the home, whilst freeing from purchase tax "a large range of inefficient and out of date analogous domestic equipment"; and when it would be possible to do without this particular revenue. Mr. Amory said he could not anticipate his Budget decisions.

Radioactive Substances Bill

The Radioactive Substances Bill was read the third time in the Lords and passed to the Commons.

Sites for Two 2,000 MW Stations

THE Central Electricity Generating Board announces that suitable sites for large coal-fired power stations have been found at two places in Nottinghamshire. Each of the sites is considered suitable for a station of about 2,000 MW capacity, burning as much as 5 million tons of coal a year; and there is the possibility of further development at a later date. One of the sites is at Holme Pierrepont, about two miles south-east of Nottingham, and the other at West Burton, about two miles south-west of Gainsborough.

The search for sites has been concentrated near the Nottinghamshire and North Derbyshire coalfield, which is the largest producer of coal for electricity generation. Mining in this coalfield is extensively mechanised and a number of new sinkings or major reconstruction schemes are in hand. As a result, the efficiency and productivity of this coalfield, already well above the average for the country, are expected to rise still further. Output will rise as well, and this is particularly true of the small coals that power stations can burn efficiently.

The West Burton site adjoins an existing railway line over which large quantities of coal can be drawn from collieries served by the network of railway lines in the northern part of the coalfield. The Holme Pierrepont site can be rail connected by a short spur off the line now being constructed to link the new Cotgrave Colliery with the railway system in the southern part of the coalfield. The sites, which have yet to be authorised, are close to the River Trent, the only adequate source of cooling tower make-up water for large power stations in the East Midlands. The investigations in the East Midlands have also revealed sites suitable for later power stations at Cottam and Ratcliffe-on-Soar, as well as a site at Market Warsop that will become suitable if the dry cooling tower proves to be a commercial proposition.

Patents in Russia

The final report of the patents delegation that visited the Soviet Union in November/December last year has now been published, price 2s 6d. The report also contains translations of the current Soviet laws and instructions to applicants for patents and trade marks. It can be obtained from H.M. Stationery Office and the Sales Branch, Patent Office, Southampton Buildings, Chancery Lane, London, W.C.2.

GENERATION and DEVELOPMENT

Higher Charges in South Scotland

As reported in last week's issue, the South of Scotland Electricity Board has revised its domestic, farm, catering and general block tariffs. The new charges, which will come into force on 1st April, are as follows; for comparison, existing rates are given in parentheses:—

Domestic Tariff.—Primary rate for each of the first 15 kWh a quarter per chargeable room, 6d (5½d). For the next 15 kWh there is a new secondary rate of 1½d/kWh and additional supplies are charged at the present rate of 1d/kWh. The number of chargeable rooms is limited to ten.

Farm Tariff.—Primary rate 6d (5½d); secondary rate 2d (1⅞d), applicable to 900 instead of 800 kWh; additional supplies, 1d/kWh.

Catering Tariff.—Flat rate of 1⅓d (1¼d).

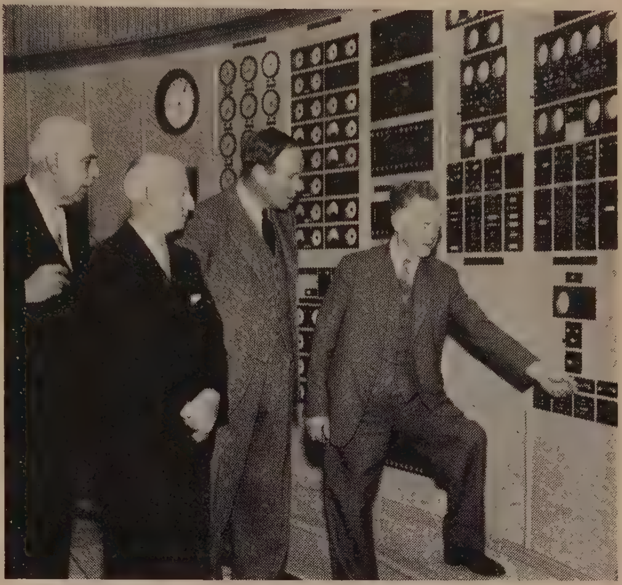
General Block Tariff.—Primary rate, 6d (5½d); additional supplies at 2d (1⅞d).

The Board is also varying its public lighting tariff by increasing the primary rate from 2·5d to 2·75d/kWh for the first 1,200 hours' use per annum, the subsequent rate remaining at 0·9d. This revision will take effect from the end of the quarterly periods of account current on 14th May.

The maximum demand tariff is being reviewed and consumers taking supplies under this tariff will later share in the general increase. This revision will take into account the trend in costs towards higher fixed charges due to higher capital investment and lower running charges consequent upon improved efficiency in generation. As off-peak tariffs are related to the running charges, it is likely that these tariffs will be reduced.

Improved Supply to Largs and Fairlie

The South of Scotland Electricity Board has authorised a scheme, estimated to cost £81,400, for the reinforcement of supply to Largs and Fairlie to meet the growing load in these towns. The scheme provides for the installation of new 33 kV switch equipment at Saltcoats 132/33 kV substation, the erection of a 33 kV overhead line from Saltcoats to Fairlie and the development of the existing substation at Fairlie by the installation of a 5 MVA, 33/11 kV transformer and the erection of a substation building which will be equipped with a 10-panel 11 kV switchboard. The work is to be carried out this year.



The Minister of Power, Mr. R. Wood, in the North Eastern Electricity Board's control room during a recent visit to the area. With him are Mr. H. Esther, the Board's chief engineer (extreme left), Mr. T. M. Ayres, chairman of the Board (second from left) and Mr. J. E. Finn, chief control engineer (right)

Minister's Visit to North-East

The Minister of Power, Mr. Richard Wood, included North-East England in a recent tour of inspection and called at the headquarters of the North Eastern Electricity Board at Newcastle-upon-Tyne. While there, he visited the Board's high voltage system control room and the Service Centre, and the accompanying photograph, reproduced by courtesy of the *Northern Echo*, was taken on that occasion.

Reconstructed Cardiff Showroom

St. David's Day, 1st March, saw the opening of the South Wales Electricity Board's completely reconstructed and much enlarged showroom at The Hayes, Cardiff. Welcoming the Lord Mayor (Ald. Mrs. Helena Evans, J.P.), who performed the ceremony, Mr. W. A. Gallon, chairman of the Board, said that behind the modern façade of the new showroom lay a colourful 60 years of history. In 1900 the ground floor of the original building was used as an open fish market, whilst above it were the offices of the Cardiff Cor-

Front half of the reconstructed showroom of the South Wales Electricity Board at The Hayes, Cardiff. Right: The Lord Mayor (Ald. Mrs. Helena Evans) trying the "Publiphone" which automatically answers questions about electrical appliances. With her is the chairman of the Board, Mr. W. A. Gallon poration Electricity and Tramways Department. There was a substation of the Electricity Department in the basement. In 1937 the whole of the building was taken over by the Electricity Department and the ground floor converted into a showroom and demonstration theatre. The architect responsible for this conversion—no easy matter, due to the method of supporting the upper floors on cast-iron columns—was Mr. Percy Thomas, O.B.E., and it was he who, 22 years later, as Sir Percy Thomas, was entrusted with the task of designing the "new look" showroom of 1960.

Modern ideas in decor, in the design of the furniture and fittings, and in the lighting combined to give the new showroom an airy and spacious look. The floor is heated electrically and for the comfort of "window-shoppers" there are infra-red heaters in a canopy over the windows. A feature which will make the new showroom a focal point after dark is an electronically-controlled display lighting system, bathing the appliances on show in constantly-changing coloured light.

Referring to the growing demand for domestic electrical appliances, Mr. Gallon said that in 1937 appliance sales in the showroom amounted to £11,000; by 1959 the value of sales had increased to £300,000, and he looked forward to a figure of £500,000 for the coming year.

The contractors for the new showroom, which is the largest and most modern of its kind in Wales, were E. Taylor & Co., Ltd., Treforest. Despite the magnitude of the work, which entailed virtually rebuilding the whole of the ground floor, a full service was provided to consumers during the whole reconstruction period.

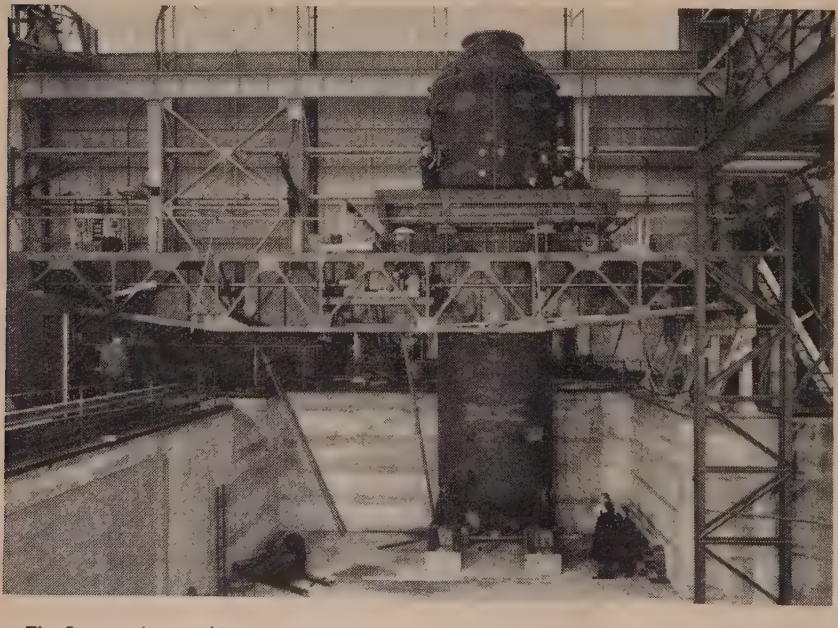
Power Line Inspection by Helicopter

The first stages of an experiment in the aerial inspection of power lines were successfully carried out recently in the area of the South Western Electricity Board, despite rain and poor visibility. Flying in a Westland Widgeon helicopter, Mr. R. Symons, district engineer, and three other engineers inspected about 60 miles of 11 and 33 kV lines in the neighbourhood of Yeovil, Crewkerne, Chard and Martock. Mr. Symons also recorded his observations, using a portable tape recorder. In the next stage a ciné-photographer exposed some 800ft of colour film to show the condition of pole-mounted switchgear, transformers and insulators; the security of line attachments; and to note any obstructions such as trees and new buildings.

System Reinforcement in South-West

Details have recently been announced of some of the work of reinforcement which is at present being carried out in the area of the South Western Electricity Board. Speaking at the annual dinner of the Bristol and District Branch of the Chartered Institute of Secretaries, Mr. A. N. Irens, the chairman of the Board, said that they had inherited from the Corporation a fine engineering enterprise which had been able to cope with a growth in load from 129 MW when they took over to the present 216 MW. The time had now arrived, however, when considerable capital investment—amounting to over £600,000 this year—was required to maintain the reliability of supply. The whole network was being strengthened and booster centres provided at Clifton and Bedminster.

In the South Hams area (Devon) work is going ahead on a scheme to improve supplies to nearly 9,000 consumers. Referring to this at Torquay on 1st March, Mr. A. W. Allwood, district manager, said that the project was being carried out in three stages at a cost of nearly £25,000. New switchgear had been installed at Kingsbridge substation, a new 11 kV line had been erected in the Osborne Newton area, and an alternative h.v. link was to be brought in from the Modbury area. Modifications were also being made to the overhead lines feeding Salcombe so that an alternative supply would be available. This scheme was only part of the total reinforcement work being carried out in South Devon, where the investment this year amounted to over £350,000.


The first service-machine vessel for Hunterston nuclear generating station supported from the ground prior to final installation in its bridge structure for tests at the Erith Engineering Works of the G.E.C.

Briquetting Plant for Kingston

An order, valued at £31,000, has been received by the Chemical Engineering Division of W. C. Holmes & Co., Ltd., for the installation of a complete briquetting plant at the Kingston-on-Thames "B" power station of the C.E.G.B. This plant has been designed in collaboration with Neldco Processes, Ltd., and Conreur Ledent et Cie, Raismes, France, who will supply the press.

Standardisation Programme to be Accelerated

In a statement to the East Midlands Electricity Consultative Council last week, Mr. N. F. Marsh, chairman of the Board, reviewed the progress made in changing over non-standard supplies and said that, as the programme of rural electrification was now nearing completion, the Board would be able to allocate a larger part of its capital resources to standardisation work.

At vesting day, no fewer than 280,000 consumers out of a total of nearly 900,000 were receiving non-standard supplies. In spite of the limited finance available, this number had been reduced to 166,000 at 31st March, 1959 (38,000 d.c., 125,000 non-standard a.c. and 3,000 non-standard frequency). To complete the work nearly £4½ million would have to be spent on mains, services and the reinforcement of the h.v. network. In addition, £2½ million would have to be spent on revenue account for the changing-over of consumers' apparatus.

In dealing with the plans for individual areas, the chairman indicated that, in localities where there were fewer than 5,000 non-standard supplies, the work should be completed within the next three years. The most difficult areas were Nottingham, Derby, Burton, Northampton and Coventry, which together had 147,000 consumers on non-standard supplies. It was hoped that all these consumers would be changed over within ten years. The Board intended to review the position in three years' time when it might be possible to speed up the remainder of the programme.

Objections to Overhead Lines

South Shields Town Council is continuing its opposition to a scheme by the Central Electricity Generating Board for the construction of a high-voltage overhead line through the town. The Council is insisting that the cable should be placed underground in the built-up area.

Commenting on the Eston U.D.C.'s objections to the erection of a high-voltage line over a housing estate at Grangetown, the North Eastern Electricity Board has pointed out that if the line was re-routed eastwards as suggested it would cross land scheduled for industrial development. It was only because of "compelling interests" that the line had been sited over dwelling houses. The Board would not have made the application if it had thought that there was any risk to the occupants of the houses.

Turbo-Alternator Order for Richborough

Richardsons Westgarth (Hartlepool), Ltd., has received an order for the third 120 MW turbo-alternator for Richborough power station, Kent. The company had already obtained contracts for Nos. 1 and 2 sets. The turbines will be of the three cylinder high-pressure reheat type and the alternator will be hydrogen cooled.

Rural Electrification in Tyrone

Protests against the delay in rural electrification were made at a meeting of the Tyrone Committee of Agriculture recently. Mr. E. V. M'Cullagh said that there were many areas in the county without hope of getting electricity because of the guarantees required. The Committee passed a resolution, to be sent to the Ministry of Agriculture, expressing dissatisfaction with the rate of progress and suggesting that the subsidising of supplies to areas still without electricity should be considered.

Model of the Rance tidal power scheme

Solway Supply Scheme

The North Western Electricity Board is to go ahead with an electricity supply scheme for the Solway area, including the Holme Low, Causewayhead, and Cardurnock districts. Efforts have been made for more than 20 years to obtain an electricity supply for the area.

OVERSEAS

Gas Turbines for Pakistan

The first of two gas turbines ordered by the Pakistan Water and Power Development Authority has recently been brought into service at Multan. The unit is operating on natural gas but has been designed also to run on gas oil. The nominal rating of the unit is 5,700 kW with an ambient temperature of 40°C. With an ambient temperature of 18°C, however, an actual output of 7,400 kW has been obtained.

The second gas turbine, originally intended for Multan, is now to be installed at Hyderabad. Erection of this unit will commence shortly and it will be in service later in the year. Both units were built at the works of Richardsons Westgarth (Hartlepool), Ltd., to Brown Boveri designs.

Tidal Power

The French Government is to finance the construction of the tidal power scheme on the estuary of the River Rance on the north coast of Brittany. It is estimated to cost at least £25 million, spread over seven years, and to produce about 800 million kWh a year. In the model of the scheme, above, the 800 yd wall across the estuary can be seen in the background and the power house in the foreground. The tubular turbines to be used were described in the *Electrical Review*, 12th June, 1959.

Canadian Output

The latest figures of Canadian electricity production are those contained in the annual report of the Bureau of Statistics for 1958. This shows that a total of 97,467 million kWh was generated, compared with 91,042 million in 1957, an increase of 7 per cent. Public utilities produced 75,953 million kWh, while 21,514 million kWh was generated by industrial establishments, mainly for use in their own plants.

Aircraft Parking Television

An experimental installation of closed circuit television to assist the control of aircraft parking has been completed at London Airport by Marconi's Wireless Telegraph Co., Ltd. At present the marshalling supervisor relies on radio-telephony for reports of aircraft parking movements out of his view. The television system gives visual information on the numbers and disposition of the aircraft. Two type BD871 cameras have been installed at the top of lighting stands at each end of a main parking area. The signals from the cameras are fed, via control units at the bases of the stands, to monitor screens and give the supervisor a view of the parking area from both ends.

INDUSTRIAL NEWS

Atomic Groups' Negotiations Terminated

Negotiations for collaboration on future reactor systems between the General Electric Co., Ltd./Simon-Carves, Ltd., Atomic Energy Group and Atomic Power Constructions, Ltd., have been terminated, it was announced in a joint statement issued on 5th March.

Last September it was stated that agreement had been reached between the two groups to collaborate in the design and construction of nuclear power stations in the United Kingdom and that the two companies had agreed to submit joint tenders for Dungeness and further stations in the British nuclear programme. It was also stated that negotiations with a view to long-term collaboration on future reactor systems were continuing. It has not, however, proved possible to agree on the scope and functions of a new organisation to give effect to these arrangements, and negotiations between the two groups have therefore been terminated.

Monopolies Commission Report

Insulated electric cables are among the subjects which during 1959 it was suggested to the Board of Trade should be referred to the Monopolies Commission. In the annual report of the Board of Trade on the working of the Monopolies and Restrictive Practices Acts, 1948 and 1953, published last week, there is, however, a reminder that the fact that some goods are mentioned in the review does not mean that monopolistic or restrictive conditions as defined by the Act necessarily prevail or that, if they do, they are against the public interest. The cost of the Commission in the year 1958-59 was £61,686.

Engineering Production and Orders

During 1959 production of engineering and electrical goods expanded rapidly and was 6 per cent more than in 1958. In the first four months of 1959 output was 1 per cent more than a year earlier, in May and June 5 per cent more, in the third quarter 9 per cent more, and it is estimated that in the fourth quarter output was 9 per cent more. According to the Board of Trade the check to the rate of growth of engineering output in the closing months of 1959 was due to a slackening of demand for consumer durable goods, especially radio and television sets, which had been mainly responsible for the rapid expansion earlier in the year. This faltering in production of consumer goods was in part offset by an increase, beginning in the third quarter of the year, in deliveries of engineering capital goods.

Throughout 1959 orders on hand for engineering and electrical products, mainly capital goods, were fairly steady, but there was some increase in November and December. However, the indications are that orders placed before the end of the year by manufacturers did not then fully reflect their reported investment intentions.

The seasonally adjusted index of production for all industries is estimated at 118/119 for January compared with 116 in December.

Clean Air Act

A nation-wide inquiry into the working of the Clean Air Act of 1956 is being conducted by the National Society for Clean Air. A questionnaire is being sent to the 1,700 local authorities in England, Wales and Scotland who are responsible for administering the Act to ascertain how well the Act is operating. The replies to the questionnaire, after being analysed, will be the subject of reports that are to be presented for discussion at the annual conference of the Society at Harrogate in October.

New Cable Laying Ship

Cable & Wireless, Ltd., has decided to build a new cable-laying ship which will be designed to lay and handle all known types of amplifiers and cables, including the kind to be used in the 28,000-mile Commonwealth round-the-world telephone cable. It is due to be launched in 1962 and full specifications will be completed in about three months' time. It has, however, already been decided that its main features shall be approximately as follows: gross tonnage, 7,000 tons; steaming range, 8,000 miles; sea endurance, sixty days; maximum speed, 15 knots. Its carrying capacity will be 1,200 miles of light-weight telephone cable with repeaters, or 1,500 miles of conventional telegraph cable.

The new ship will be the first cable layer to have been built for Cable & Wireless, Ltd. All the seven vessels in the company's cableship fleet are cable repair ships, the largest of them being the 3,300-ton C.S. *Recorder*, completed in 1954. A new cable repair ship of about 4,000 tons gross, designed to handle coaxial cable with amplifiers, as well as telegraph cable, is now being built for the company by Cammell Laird, Ltd., at Birkenhead, and is expected to join the fleet in February next year.

R.S.A. Prizes

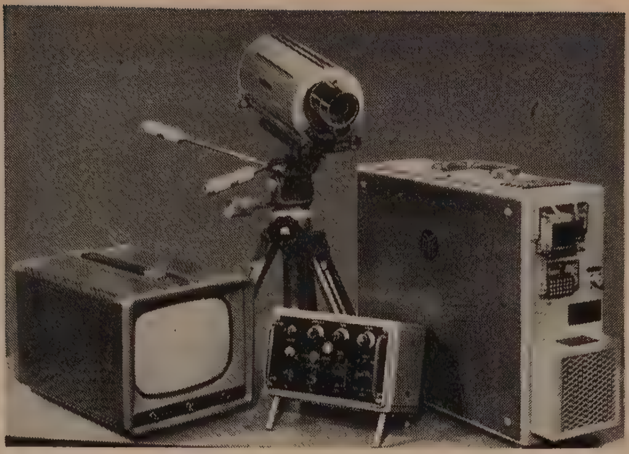
The Royal Society of Arts offers the following prizes during 1960:—Howard Prize of £50 for a treatise on mechanical motive power, and the Fothergill Prize of £20 for one on fire prevention or fire-fighting. Particulars can be obtained from the Secretary of the R.S.A., 6-8, John Adam Street, Adelphi, London, and entries must be submitted by 31st July next.

G.E.C. Belfast Branch

The new building for the Belfast branch of the General Electric Co., Ltd., was officially opened recently by Captain T. O'Neill, Ulster Minister of Finance. Sir Leslie Gamage, chairman of the company, and Mr. W. J. Bird, director for sales and marketing development, were present at the opening. When the Belfast branch first opened it was housed at 11, Queen Street, and just before moving to its new headquarters it occupied a four-storey building at 9-15, Queen Street as well as part of the premises at 7a, Queen Street.

The new premises of the Belfast Branch of the G.E.C.

Illuminated machines at the Automatic Vending Exhibition



Pye equipment for the Rank closed circuit television system

Situated in York Street at the junction of Great Patrick Street, the new building is four storeys high with showrooms and trade counter on the ground floor. Most of the second floor is devoted to stores, which with ancillary services total some 15,000 sq ft. Other floors are mainly offices. A goods lift serves all floors direct from the loading bay, while to facilitate speedy service at the trade counter a service lift operates between all floors. In addition a belt conveyor has been provided between the loading bay and the first-floor store for the movement of Osram stock. With an approximate total floor area of 25,825 sq ft, the building has been designed to allow for the maximum future expansion within the limits of the site. Mr. J. McK. Stewart is manager of the branch, which now has a staff of seventy people.

Morphy-Richards Reorganisation

An internal reorganisation of the Morphy-Richards group has been made under which the parent company has become a purely holding company and a new wholly-owned subsidiary has been formed—Morphy-Richards (Cray), Ltd.—to which has been transferred the parent company's trading undertaking. In addition, Astral Equipment, Ltd., has changed its name to Morphy-Richards (Astral), Ltd. The manufacturing activities of Morphy-Richards (Cray), Ltd., will be carried on at St. Mary Cray, Kent. The sales office of both Morphy-Richards (Cray), Ltd., and Morphy-Richards (Astral), Ltd., will be, as now, at 50, Conduit Street, London, W.1. These changes are being made only to facilitate group administration and imply no change in trading policy nor in the channels of communication.

Lighting and Automatic Vending

The growth in the use of automatic vending machines for a wide variety of products was demonstrated at the Automatic Vending Exhibition held recently at the Royal Horticultural Society's New Hall, London. Self-service, with its attendant mechanisation, has called for machines of many types in which electric lighting plays an important part in attracting the attention of the prospective customer and also in ease of operation of the machines. Our picture shows some of the illuminated machines which were on show at the exhibition.

New Drayton Companies

The Drayton Regulator & Instrument Co., Ltd., has formed, in association with the Johnson Corporation of America, a new company, Drayton Johnson, Ltd., to make available a complete steam engineering service to paper, plastics, rubber, textile and other machinery manufacturers.

Another recently-formed concern is Drayton Controls (Heating), Ltd., to handle the parent company's space heating and air conditioning control business.

Severn Tunnel Pumping Station

A contract for over £100,000 has been placed by British Railways Western Region with the Brush Electrical Engineering Co., Ltd., a member of the Hawker Siddeley Group, for the electrification of the Severn Tunnel pumping station at Sudbrook, near Chepstow, Monmouthshire. The Cornish beam steam engine-driven pumping plant for the removal of natural seepage and drainage was installed in 1870 and has been in operation until the present day.

The equipment to be supplied includes a substation containing a 23-panel, 3·3 kV, 75 MVA type VBA solenoid-operated switchboard and a 17-panel control board for supervising the pumps, fans, auxiliary transformers and alternators. Although power for this installation will normally be taken from the public supply, two diesel generating sets will also be installed as standby plant for emergency use. These will be equipped for automatic starting, with both remote and local indication, and each set will be capable of accepting full load within 15 seconds. The generating sets will comprise a type JVSS 16-cylinder vee-form, totally enclosed four-stroke pressure charged and intercooled diesel engine manufactured by Mirrlees, Bickerton & Day, Ltd., who are also members of the Hawker Siddeley Group. Each engine will develop 1,881 b.h.p. at 750 r.p.m. and drive a 3·3 kV 1,345 kW, 0·9 power factor 50 c/s Brush alternator.

B.L.C. Conferences

A conference on industrial lighting has been organised by the British Lighting Council to be held on 16th March at St. Peter's Church Hall, St. Peter's Street, Ipswich. The registration fee is 10s 6d and applications should be made as soon as possible to Mr. G. B. Durham, Eastern Regional Engineer, British Lighting Council, Brettenham House, 16-18, Lancaster Place, London, W.C.2.

A series of three meetings for the staff of electrical contractors and others selling lighting equipment has been arranged by the Council and will be held at the Greyhound Hotel, High Street, Croydon, at 6.30 p.m. on 17th, 24th and 31st March.

Industrial Television Service

Surveys are currently being made by Rank Precision Industries, Ltd., to determine whether firms could profitably use closed circuit television. If required, individually planned systems are then installed. The equipment which forms the basis of an installation consists of a camera, camera control unit, camera control panel and monitor screen. The camera is 11in long and weighs 7 lb. Pictures may be relayed on to a number of monitors and focusing can be operated by remote control. Special camera housings are available for hazardous, destructive and other unusual conditions of operation. Equipment is also available for document transmission, while telecine installations can be provided for relaying films to a number of monitors. Full details are available from the company at 37-41, Mortimer Street, London, W.1.

Equipment for Royal Radar Establishment

The Ministry of Aviation, acting on behalf of the Royal Radar Establishment at Malvern, has placed an order with Marconi's Wireless Telegraph Co., Ltd., for the supply and installation of a 50 kW 50 cm airfield control radar, type S264, together with two moving coil display units and ancillaries. The equipment, which will be sited at the R.R.E. airfield at Pershore, Worcestershire, is scheduled to go into operation by the middle of this year.

"Son et Lumiere" at Croydon

In our last issue we reported the first performance at Croydon Parish Church of the *Son et Lumière* as part of the borough's millenary celebrations, in which Atlas "Aurama" electronically controlled sound and light spectacle is employed. The spectacle in the church takes place mainly behind the rood screen where a variety of incandescent and fluorescent fittings are concealed. Blue and pink fluorescent tubes are used for the main general lighting effects (plus orange during a particular stage of the performance) and these are supplemented by a series of high wattage spotlights and some of the new Atlas low voltage spotlights in other parts of the church to highlight certain features of the carved oak screen. Floodlights shine into the church through the windows.

Son et Lumiere at Croydon Parish Church

Atlas electronic dimmer banks, using thyratron valves, feed each lighting circuit. The grids of these valves are controlled by a simple phase shift circuit, one leg of which is a capacitor and the other a photo-conductive cell. When the light from an exciter lamp falls on the cell, the valves are conducting. This exciter lamp is connected to the anode circuit of a hard valve, the grid circuit of which is controlled by two further photo-conductive cells, one of which determines the intensity of the exciter lamp, while the second fixes the time taken to reach this level. These two photo-cells are illuminated by a common exciter lamp. A film medium is moved in steps towards the cells on the lamp and as each frame moves into position the lighting change is initiated.

Superimposed on the sound track are a series of signals, each of which triggers off a change in the lighting. These signals "fire" the thyratron valves and the output of these valves during the conducting period is rectified, providing a d.c. signal which is distributed by stepping switches to the dimmer units.

Northern Management Conference

The British Institute of Management is holding a conference at Southport on 21st and 22nd April at which the theme will be "The Problem of Growth." Mr. W. H. McFadzean, president of the F.B.I. and chairman and managing director of British Insulated Callender's Cables, Ltd., will speak at the closing dinner on 22nd April.

Crompton Parkinson Manchester Branch

Crompton Parkinson, Ltd., announces the opening of a new Manchester branch at Longley Lane, Wythenshawe (telephone: Gatley 8441). The company has vacated its former premises in the centre of Manchester and all services will now be carried on from the new address. This is the company's main supply point for the north-west area, others being at Blackburn and Liverpool. Products and plant dealt with at the new branch include all types of electric motors, switchgear, generators, B.E.T. transformers, cable, instruments, stud welding equipment, batteries, lamps and lighting fittings, and ceiling fans. The associated companies, I.T.D., Ltd., and Austin-Crompton Parkinson Electric Vehicles, Ltd., as well as the company's Contract Department, are now housed under the same roof.

The new Manchester premises of Crompton Parkinson, Ltd.

Durham Bursary

The Junior Institution of Engineers announces that the final date for the receipt of theses for the annual competition for the Durham Bursary is 31st July. Candidates must be over 19 and under 25 years of age, but need not be members of the Institution, although the award (£20 in cash) carries with it membership of the Institution for three years. Entry forms and full particulars can be obtained from the secretary of the Institution, Pepys House, 14, Rochester Row, London, S.W.1.

Printing Equipment Order

Printing equipment valued at £650,000 is being supplied to Thomson Newspapers, Ltd., by Witton-James, Ltd., a subsidiary of the General Electric Co., Ltd. The order for 86 "Autopaster Reelstands" is the largest single order ever placed with the company. The equipment will be used in conjunction with press lines supplied by the Goss Printing Press Co. It includes press driving equipment, Witton-James-Wood "Autopaster Reelstands" and ancillary equipment. Delivery will be completed by mid-1963. A total of eighty-four d.c. motors of 60 h.p. form

Silicon Diodes

SERIES	Current Rating Amps.	P.I.V.	Bulletin No:
6F	**6**	**50 to 500**	**SR 308**
12F	**12**	**50 to 500**	**SR 308**
25H	**45**	**50 to 600**	**SR 304**
25HB	**45**	**50 to 600**	**XSR 310**
45L	**150**	**50 to 800**	**SR 300B**
70U	**250**	**50 to 600**	**SR 305**

Manufactured and tested to the most rigid specifications, as their field reliability has proved.

Stack assemblies can be readily made up by us to meet your particular requirements.

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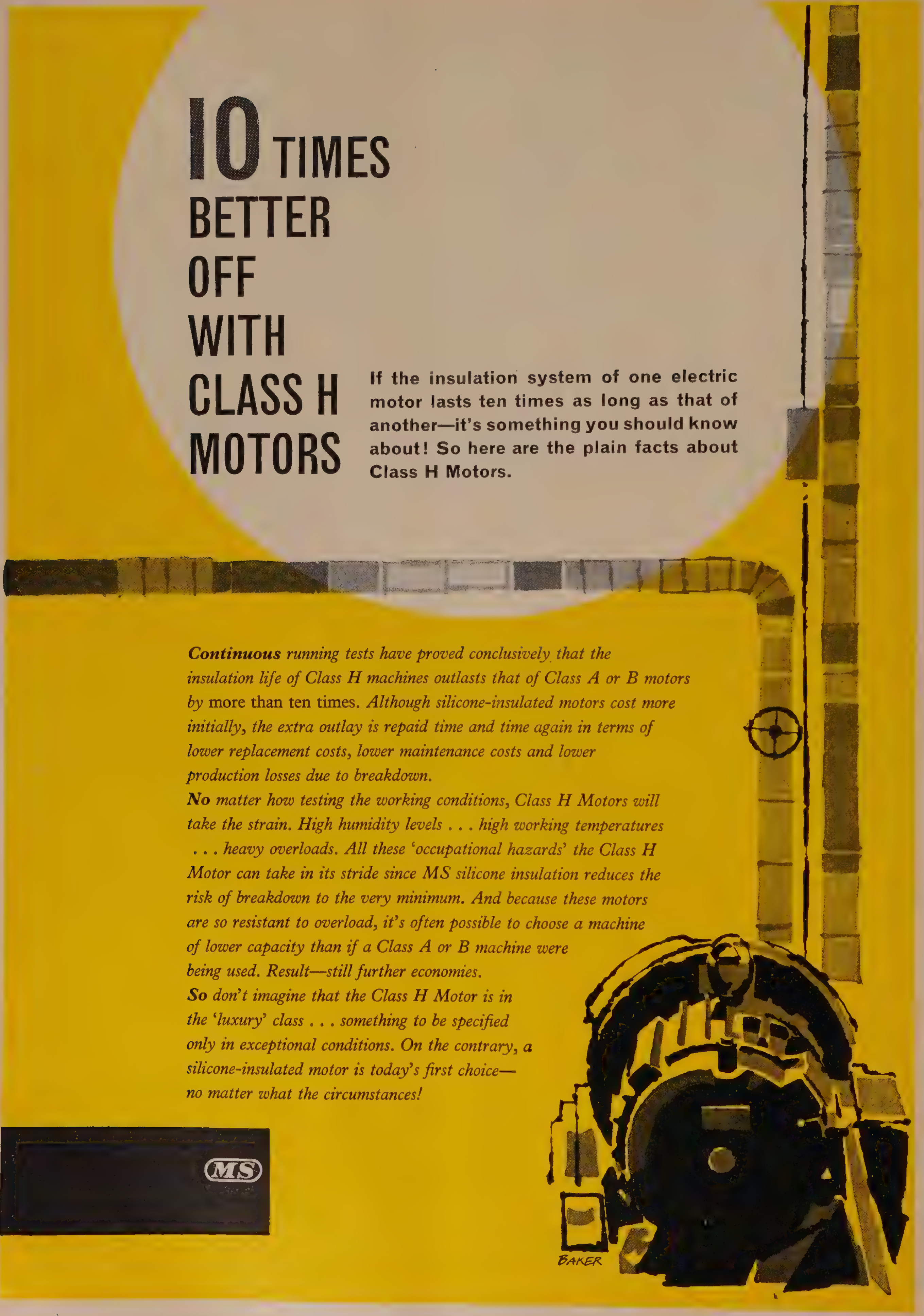
BRITISH ASSOCIATE COMPANY OF INTERNATIONAL RECTIFIER CORP · CALIFORNIA · USA
The World's Largest Supplier of Industrial Metal Rectifiers—Selenium, Germanium and Silicon

10 TIMES BETTER OFF WITH CLASS H MOTORS

If the insulation system of one electric motor lasts ten times as long as that of another—it's something you should know about! So here are the plain facts about Class H Motors.

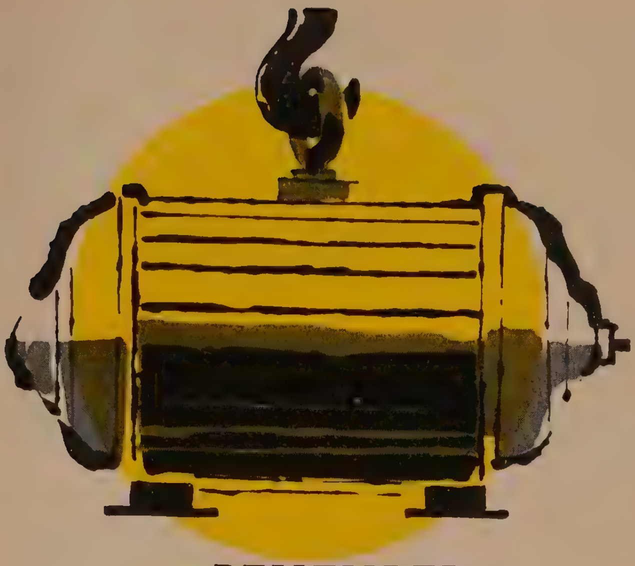


***Continuous** running tests have proved conclusively that the insulation life of Class H machines outlasts that of Class A or B motors by* more than ten times. *Although silicone-insulated motors cost more initially, the extra outlay is repaid time and time again in terms of lower replacement costs, lower maintenance costs and lower production losses due to breakdown.*

***No** matter how testing the working conditions, Class H Motors will take the strain. High humidity levels . . . high working temperatures . . . heavy overloads. All these 'occupational hazards' the Class H Motor can take in its stride since MS silicone insulation reduces the risk of breakdown to the very minimum. And because these motors are so resistant to overload, it's often possible to choose a machine of lower capacity than if a Class A or B machine were being used. Result—still further economies.*

***So** don't imagine that the Class H Motor is in the 'luxury' class . . . something to be specified only in exceptional conditions. On the contrary, a silicone-insulated motor is today's first choice—no matter what the circumstances!*

MS



REMEMBER SILICONES FOR REWINDS TOO

The value of silicone insulation is by no means restricted to new machines. Many a troublesome Class A or B motor—given to repeated breakdowns—has been totally transformed by a timely silicone rewind.

At the Latchford Locks Works of the British Aluminium Co. Ltd. a centrifuge, used for cleaning aluminium swarf, is powered by a 15 HP motor which is mounted beneath the centrifuge. To help in the cleaning, live steam at about 10 psi is admitted to the centrifuge while it is in motion. The motor, when new in 1954, was wound with Class A insulation, but failed after eight months due to condensation on the windings. Rewound with Class A it failed again—this time after only two weeks' service. To prevent repetition of these failures the motor was then rewound using silicone insulation, and in fact ever since it was recommissioned in May 1955, British Aluminium report, 'the centrifuge has been used almost constantly without further trouble with the motor windings'. They go on to say, 'There is no doubt that the employment of silicone insulation has greatly lengthened the trouble-free working of the winding of this motor.'

***These** are the leading manufacturers of Class H Motors : Associated Electrical Industries (Rugby) Ltd · The General Electric Co Ltd · Bruce Peebles & Co Ltd · Woods of Colchester Ltd · Brook Motors Ltd · Lancashire Dynamo & Crypto Co Ltd · Brush Electrical Engineering Co Ltd Howells Electric Motors Ltd · Laurence, Scott & Electromotors Ltd.*

For a list of names of the many rewinders experienced in the use of silicone insulation, contact your nearest Midland Silicones branch office.

All over Britain, MS silicones are strengthening the weak link in electrical equipment—its insulation. Midland Silicones Ltd manufacture a full range of silicone products for use in the electrical industry. And Midland Silicones Ltd consistently set the pace for progress in this fast-developing field.

MS

MIDLAND SILICONES LTD ***first*** *in British Silicones*

(Associated with Albright & Wilson Ltd. and Dow Corning Corporation)

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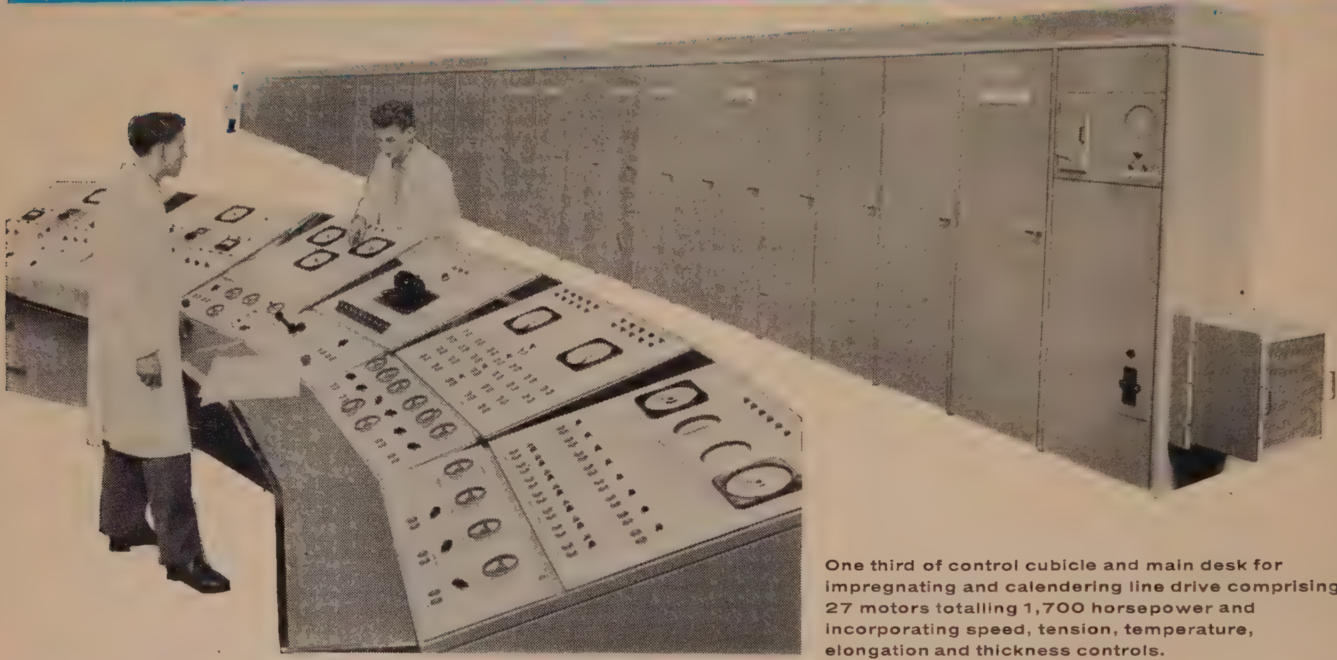
MSE 4

MACHINE DESIGNERS AND PROCESS ENGINEERS

New developments in adjustable speed drives provide the performance *you* need—economically



One third of control cubicle and main desk for impregnating and calendering line drive comprising 27 motors totalling 1,700 horsepower and incorporating speed, tension, temperature, elongation and thickness controls.

Advanced design concepts now enable specialised drives to be tailored to your needs at lower cost. Ratings from fractional to 10,000 horse-power incorporating such features as wide speed range, high performance and automatic control from process variables

Using alternatively two basic power conversion systems to feed the d.c. driving motor—one static, the other rotating—together with closed loop servo control of speed—this unequalled range of drives is unique in its exceptional adaptability.

An extensive range of performance characteristics is available, up to 100:1 speed range—torque control—controlled acceleration—multi-motor speed matching—speed proportioning, together with many others.

The drives are also designed to operate with a standard range of transducers to provide automatic control from material tension and linear speed—pressure—flow—temperature—thickness, to name but a few examples.

In addition, following two years' field experience with the Transidyne fully transistorized control system in smaller ratings, semiconductor control has now been extended to drives up to 10,000 h.p. thus offering yet another plus to engineers applying all types of adjustable speed drive.

For more details of these exciting new developments, write for Application Case Study No. 115—'Specialised Adjustable Speed Drives' to Systems Division at the address below.

LANCASHIRE DYNAMO ELECTRONIC PRODUCTS LIMITED

S.Y.I.

RUGELEY · STAFFORDSHIRE ENGLAND

Manufacturers of the world's widest range of industrial electronic control equipment

the press driving equipment. They are coaxially mounted with the press mainshaft. The "Autopaster Reelstand" equipment will incorporate pneumatically-controlled self-regulating web tension and electronic "Roboreel" devices. It will be fully automatic and will enable pasting to be carried out at the maximum geared speed of 60,000 copies per hour. Ancillary equipment will include photo-electric web break detectors, web severer/grippers and press unit vertical shaft brakes.

Permali in Canada

Following the increasing demand for vacuum-cast epoxy resin components for the heavy electrical industry, Permali, Ltd., Gloucester, has decided to extend this production to its Canadian works. Technical representatives from Gloucester will be going to Canada this month, to supervise the installation and initial production of low-voltage bushings and stand-off insulators.

New Osram Tube Colour

The "Osram" de-luxe natural tube, now being marketed by the General Electric Co., Ltd., will be of value in catering establishments, restaurants, florists' shops and similar places. It creates the bright and fresh atmosphere characteristic of the cool colour tube, but overcomes previous difficulties in achieving good appearance of red colours under cool fluorescent lighting. A special blend of fluorescent powders, produced by the Discharge Lamp Development Laboratory attached to the Osram Lamp Works at Shaw, has enabled these colour-rendering properties to be achieved. The tubes, available in 8ft 125 W, 5ft 80 W, and 4ft 40 W sizes, carry a free replacement guarantee if failure occurs before 3,000 hours or one year of service.

Engine Component Makers' Expansion

Hepworth & Grandage, Ltd., Bradford, manufacturers of "Hepolite" engine components, announce that their 1960 development programme will involve capital expenditure of over £700,000. A large proportion of this sum will be spent in the modernisation of plant and machinery and the installation of specially developed production equipment and on new building schemes.

Hoover Gift to Employees

Mr. H. W. Hoover, chairman of Hoover, Ltd., Great Britain, and president of the Hoover Co. of America, has announced a gift by his company of £250,000 to all employees of Hoover, Ltd., in the United Kingdom. Payment to individual employees will be graded. Full-time employees over twenty-one who have served throughout last year or longer will receive a minimum of £15.

Price Reductions

The General Electric Co., Ltd., has reduced the prices of its BC 1255 table and the BC 1452 "suitcase" battery portable radio sets.

Dale Electric (Yorkshire), Ltd., Filey, has reduced the prices of its petrol and diesel electric generating equipment and, at the same time, the range has been extended to include sets with outputs of 380 kVA.

Caroline Haslett Memorial Trust

The Caroline Haslett Memorial Trust announces that the first award to be made by the general section of the Trust will be an exhibition to enable a woman engineer to visit the U.S.S.R. for the purpose of studying the training, employment and prospects of Soviet women engineers. Applications for the exhibition are invited from women engineers in the United Kingdom whose training and experience would fit them to make the proposed study. The visit will be a short one and will probably take place in the early autumn of this year. After her return to this country the exhibitioner will be required to prepare a report for the Trust and to lecture on her findings. Application forms, which should be returned before 31st March, may be obtained from the Secretary, Caroline Haslett Memorial Trust, 25, Foubert's Place, London, W.1.

Nuclear Fuel for Japan

Last Monday Mr. Daigoro Yasukawa, president of the Japan Atomic Power Co., and Sir Roger Makins, chairman of the United Kingdom Atomic Energy Authority, signed the heads of contract for the supply of natural uranium fuel elements for the 150 MW nuclear power station which the General Electric Co., Ltd., is to build in Japan for the Japan Atomic Power Co. The document signed establishes the main features of the detailed contract which will govern the supply of new fuel and the re-purchase of irradiated fuel during the first ten years of the reactor's operation. This detailed contract is not due to be signed until early 1962, about a year before the first deliveries of fuel are required. The agreement of heads of contract is a further step towards implementing the letter of intent to supply the fuel for this station which the Atomic Energy Authority gave to the Japan Atomic Power Co. in April, 1959.

Prestcold Finance, Ltd.

A new company, registered as Prestcold Finance, Ltd., has been formed to enable buyers of commercial equipment from Prestcold branches and subsidiary companies to enjoy special and direct hire-purchase facilities.

Trade Announcements

Torial Electrical, Ltd., 42-44, Great Titchfield Street, London, W.1, has been appointed sole distributor of "Dowsing" industrial ironing equipment.

The telephone number of the Hull depot of the **Marconi International Marine Communication Co., Ltd.,** will be changed on 1st April to Hull 26144.

Sir W. H. Bailey & Co., Ltd., has appointed Mr. B. D. Hayes as its technical representative in the East and West Ridings of Yorkshire. His address is 1, Ashworth Close, Bakersfields, Nottingham (telephone: Nottingham 24-8629).

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £255 10s 0d
Fire Refined 99·70%	ton £254 0s 0d
Fire Refined 99·50%	ton £253 0s 0d
COPPER Tubes ..	lb 2s 5⅝d
Sheet	ton £286 5s 0d
H.C. wire and strip	ton £309 5s 0d
LEAD, English ..	ton £75 10s 0d
Foreign	ton £74 0s 0d
MERCURY	flask £71 10s 0d
TIN, block (English) ..	ton £783 10s 0d
ZINC, G.O.B. Foreign	ton £87 15s 0d
BRASS Tubes (solid drawn)	lb 2s 0⅜d
Wire	lb 2s 9⅞d
PHOSPHORBRONZE Wire	lb 4s 3½d
PLATINUM ..	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 34d—34¼d

I.E.E. Centre Dinner

The North Midland Centre of the Institution will hold its annual dinner-dance on 25th March (7 for 7.30 p.m.) at the Refectory, Leeds University. Applications for tickets (30s each for members, 20s each for members of the Student Section) should be made by 18th March to Mr. H. A. Carr, c/o A. Reyrolle & Co., Ltd., St. Paul's House, 20-22, St. Paul's Street, Leeds, 1.

Letter to the Editor

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Overhead Lines *versus* Underground Cables

MR. J. L. EGGINTON'S letter, published in your issue of 26th February, criticises the basis of comparison of cost between overhead lines and underground cable for the 132 and 275 kV cases contained in Table 1 of our article published on 22nd January. His comments are welcomed, if only because they focus attention on the qualifications that must always be attached to straight cost comparisons between overhead lines and underground cables, particularly in the higher range of system voltages.

The cable ratings in Table 1 of the article were based on the general order of maximum load capacities of 132 and 275 kV lines consistent with distances and operating conditions in the United Kingdom (for example, see Sayers, Forrest and Lane's I.E.E. paper on "275 kV Developments on the British Grid"). There must, admittedly, be circumstances where the thermal current rating of the overhead line conductors impose, or is made to impose, the sole upper limit on the amount of power that may be transmitted and Mr. Egginton, in fact, posed this condition as a more correct comparison to the extent of quoting the C.E.G.B.'s interpretation of cold weather current ratings for the overhead conductors, corresponding to 126 and 760 MVA respectively, for the 132 and 275 kV circuits concerned. On this basis the underground cable costs are, of course, greater than those shown in Table 1. The Board's own estimated figures for the 275 kV cables, for example, are likely to have been based on 3/·75 sq in cables per phase owing to limitations in spacing in built-up areas. Two cables per phase of 1 sq in area can deal with this 1,600 A load under the rural conditions described in the published comparison in Table 1 of the article, our estimated installed price of which is about £240,000 per mile.

London, W.C.2.

N. G. SIMPSON,
P. W. CAVE.

I.E.S. Liverpool Centre Luncheon

THE great scope for the floodlighting of churches, cathedrals and public buildings whose features were hidden by night and only inadequately revealed in daylight was stressed by Dr. F. A. Benson, A.M.I.E.E., M.I.R.E., vice-president of the Illuminating Engineering Society, at the annual luncheon of the Liverpool Centre, held at the Exchange Hotel, Liverpool, on Monday last. Referring to interior lighting, Dr. Benson said that the lives of hot cathode fluorescent lamps were now well in excess of the minimum rated life of 5,000 hours, while cold cathode lamps lasted for 20,000 hours and the limit had not yet been reached. The day might not be far off, if indeed it was not already here, when it would be possible to box up lamps in rather inaccessible places, confident that they could be forgotten until the scaffolding went up again for repainting.

For street lighting in Britain there had been a pronounced swing towards sodium lamps. When the high pressure mercury vapour lamp became established it might strongly challenge both sodium and tubular fluorescent lamps.

The Lord Mayor of Liverpool (Ald. H. N. Bewley, C.B.E.) commended the floodlighting of Liverpool Cathedral which, he said, was one of the most ambitious floodlighting schemes ever undertaken in the city; he hoped it would be the forerunner of many others of a like kind. Other speakers were Professor W. Lyon Blease, LL.M., and Mr. W. J. Forster, M.I.E.E., who presided.

British Appliances at Cologne Fair

SPEAKING yesterday (Thursday) at the exhibition organised jointly by the British Electrical and Allied Manufacturers' Association and the Board of Trade at the Cologne Fair, Mr. S. F. Steward, C.B.E., director of the B.E.A.M.A., made reference to the tremendous developments in design and output of domestic electrical appliances both on the home and export front. He made a comparison between the developments in Germany and the United Kingdom and said that the two countries could well complement and strengthen one another in their efforts to improve the lot of the housewife and the general standard of living throughout Europe.

He said that the B.E.A.M.A. was working actively to build a bridge between the Common Market and the European Free Trade Association since he felt strongly that there must be a united Europe and not two sharply divided sides pulling in different directions. The B.E.A.M.A.'s entry into the Cologne Fair for the first time was an earnest of this intention.

He was speaking to a gathering of distinguished guests invited from German public life, science, industry and the international and technical Press as well as Her Majesty's representatives of the British Embassy in Bonn.

Mr. Steward touched on the quality and diversity of the appliances on show, which included products from the following companies:—Columbus-Dixon, Ltd., Corfield-Sigg, Ltd., Dimplex, Ltd., Electrical Division of Radiation, Ltd., Electrix, Ltd., English Electric Co., Ltd., Hoover, Ltd., Remploy, Ltd., Revo Electric Co., Ltd., and Simplex Electric Co., Ltd.

At the annual luncheon of the I.E.S. Liverpool Centre. Left to right: Mr. N. Blackman (secretary, Liverpool Centre), Mr. W. J. Forster (Centre chairman), Lord Mayor of Liverpool (Ald. H. N. Bewley), Prof. W. Lyon Blease, Dr. F. A. Benson (vice president, I.E.S.) and Mr. J. S. Buck (treasurer, Liverpool Centre)

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Council of the City and Guilds of London Institute has conferred the Fellowship of the Institute (F.C.G.I.) upon the following past students of the City and Guilds College in recognition of their distinguished contributions to industry or the professions in which they are engaged:—**Mr. J. J. Gracie,** C.B.E., LL.D., M.I.E.E., a director and general manager of the G.E.C. Engineering Works at Witton, Birmingham, a member of the governing body of the Birmingham College of Advanced Technology, a life governor of Birmingham University and a member of the National Council for Technological Awards; and **Mr. D. W. Morphy,** A.C.G.I., B.Sc., D.I.C., joint managing director of Morphy-Richards, Ltd., a member of the Council of the Council of Industrial Design, and of the Royal College of Art. In addition the Council of the City and Guilds has conferred the Fellowship of the Institute, *honoris causa*, upon **Sir Willis Jackson,** D.Sc., M.I.E.E., Hon. A.C.G.I., F.R.S., President of the Institution of Electrical Engineers, director of research and education, A.E.I. (Manchester), Ltd., and formerly Professor of Electrical Engineering and Head of the Department, City and Guilds College, Imperial College.

Mr. W. L. Harrison, A.M.I.E.E., has been appointed a senior sales engineer with the Electric Construction Co., Ltd., attached to the West Midlands area offices at 3, Vicarage Road, Edgbaston, Birmingham, 15. He served his apprenticeship with Chance Brothers & Co., Ltd., Smethwick, joining Birlec, Ltd., Erdington, in 1948, with whom he became assistant chief electrical engineer. He left that company in 1958 to become contracts manager of Birlec EFCO (Melting), Ltd., Aldridge.

Mr. W. L. Harrison

Mr. N. Readman, managing director of the Consolidated Pneumatic Tool Co., Ltd., London, a wholly-owned subsidiary company of the Chicago Pneumatic Tool Co., New York, has been elected to the board of directors of the New York parent company. He remains managing director of the Consolidated Pneumatic Co. in London, where he will continue to be responsible for all Chicago Pneumatic's operations throughout the world, outside the Western Hemisphere.

Measuring Instruments (Pullin), Ltd., has retained the services of **Mr. G. Hoffstead,** F.S.I.A., as design consultant for its products. He is working in close liaison with the Development Department, which is responsible for engineering design.

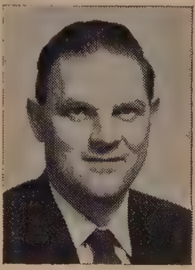
Mr. E. A. J. Hall, B.Sc., Ph.D., M.I.E.E., has been appointed technical director of Epsylon Industries, Ltd. Since becoming a member of the Stone-Platt Industries Group, Epsylon has been reconstructed and is now expanding in the fields of instrumentation, magnetic recording, digital data logging and processing, video systems and textile automation.

The Ministry of Aviation announces that **Mr. E. D. Whitehead,** B.Sc.(Eng.), has been appointed Director of Electrical Inspection in succession to **Brigadier C. A. Zweigbergk,** whose tour of duty in the Ministry will end at the beginning of April. Mr. Whitehead was some years in industry before joining the Government service in 1937, carrying out research and development on radio equipment. In 1940 he began work on radar, and in 1943 was appointed technical assistant to the Director General of Communications Equipment, a post he held for five years. In 1948 he transferred to work on telemetry, and in 1952 assumed responsibilities in radio components production. Since 1957 he has been in charge of a division of the Electrical Inspection Directorate responsible for the inspection of electronic equipment.

Mr. Basil Spence, O.B.E., A.R.A., P.R.I.B.A., has been elected president of the Building Centre in succession to the late Sir Giles Gilbert Scott.

Mr. C. K. White has been appointed chief estimator, Estimating Department, A.E.I. (Rugby), Ltd., in succession to **Mr. A. T. Gaiger** who recently retired. Mr. White was educated at Rutherford College and Rutherford Technical College, Newcastle-upon-Tyne, and later studied at Rugby Technical College (now Rugby College of Engineering Technology). After serving an apprenticeship with the Jesmond Electrical Engineering Co., Newcastle-upon-Tyne, he joined the British Thomson-Houston Co., Ltd. (now A.E.I. (Rugby), Ltd.), in 1928. He has been chief assistant, Estimating Department, since 1955.

Mr. K. R. Sandiford, B.Sc.(Eng.), has joined Hagan Controls, Ltd., one of the Plessey group of companies, as general manager. Since 1954 he has been chief instrument engineer of the Development and Engineering Group of the United Kingdom Atomic Energy Authority and has served for a period on the Committee of the Manchester Section of the Society of Instrument Technology. After gaining experience of the instrument industry, Mr. Sandiford was responsible during the war for the production of fire control instruments for British coastal artillery.



Mr. K. R. Sandiford

With the formation of the new Avel-Toroid Division of Aveley Electric, Ltd., **Mr. A. C. Green** becomes works manager, **Mr. J. R. Erskine** chief engineer, and **Mr. S. J. Arliss** production engineer. **Mr. R. S. Mattin** is responsible for all toroidal winding machine sales and service, and handles general sales inquiries for sub-contract toroidal winding. **Mr. A. J. Cornwell,** who has been with the company since 1955, will take charge of the Technical Services Department.

The Electrical Association for Women announces the following changes in its staff at headquarters and in the areas:—**Miss E. L. Mulligan,** examinations officer, retired at the end of February after twenty years' service with the Association, and has been succeeded by **Miss Rosemary Moir,** M.A.(Glasgow). **Mrs. C. Tyas** has been appointed regional organiser for Yorkshire and North-East England. **Mrs. M. Lester** continues as north-eastern area organiser and **Miss A. Burns** has resigned as Yorkshire area organiser. **Mrs. Meurig Roberts,** at present area organiser in the Merseyside and North Wales area, will become regional organiser for that area and the north-west on 1st June, when **Mrs. A. Fildes** will retire after more than twelve years' service as organiser for North-West England and North Wales. **Miss O. Kenworthy** was appointed area organiser for London and the south-eastern areas in December last, to succeed Mrs. F. V. L. Mathias, who died some months previously. **Mrs. C. R. Jones,** at present assistant area organiser in the Midlands, will become assistant area organiser in South Wales on 1st April.

Mr. F. G. Bromley, B.Sc.(Eng.), M.I.E.E., has been appointed manager of the Barnet District of the Eastern Electricity Board, with effect from 1st April, in succession to **Mr. L. F. G. Balser,** who is retiring shortly. **Mr. J. A. K. Bowerman,** at present district engineer at St. Albans, will succeed Mr. Bromley as district manager at Tottenham.

Mr. L. E. Dyche

The Eastern Electricity Board has appointed **Mr. L. E. Dyche** as district commercial engineer at Hendon in succession to **Mr. R. Church,** who recently took up a similar position at Wembley. Mr. Dyche had been assistant district commercial engineer at Hendon since 1956.

The Newage Group announce the appointment of **Mr. A. D. MacKay** as managing director of Newage Engineers, Ltd., and to the boards of the subsidiary companies, Newage (Manchester), Ltd., Arthur Lyon & Co. (Engineers), Ltd., H. E. Nunn & Co., Ltd., Newage Machine Tools, Ltd., and Newage Industries Incorporated, U.S.A. **Mr. S. J. Harris** will hold the office of executive chairman of the Newage Group, and continue as managing director of the subsidiary companies. Mr. A. D. MacKay will be at Manchester.

Mr. J. A. Dow has been appointed area commercial officer for the South Caledonia Area of the North of Scotland Hydro-Electric Board. He succeeds **Mr. J. S. Kilpatrick,** A.M.I.E.E., who is undertaking special duties in connection with consumer research. Mr. Dow is an associate member of the Institution of Agricultural Engineers and a member of the Scottish Committee of the Institution. He served with the Royal Air Force during the war and graduated B.Sc. at Reading University in 1949. Before joining the Board he was on the electrification advisory staff of the British Electricity Authority in London. He joined the Board's staff at Perth as agricultural adviser and later became consumers' adviser.

Mrs. Jean Flower has recently joined the staff of the A.E.I. Heating and Welding Department as home economics adviser in connection with the sales promotion of "Redring" radiant boiling plates. Mrs. Flower has been with Sunvic Controls, Ltd., since 1946, engaged in sales promotional work in connection with the "Simmerstat."

The annual general meeting of the **Birmingham Electrical Golfing Society** was held in Birmingham on 18th February. The president, Mr. T. C. Browne, stated that the membership of the society had increased and he congratulated Mr. F. C. Mealing, hon. secretary/treasurer, on his report and the favourable financial position of the society. The officers and committee for 1960-61 were elected as follows:—President, Mr. P. M. King; captain, Mr. J. T. Aitken; general committee, Mr. H. Martin and Mr. E. G. Noake; hon. secretary/treasurer, Mr. F. C. Mealing.

Hoover, Ltd., has announced the following appointments:—To be directors of Hoover (Electric Motors), Ltd., Cambuslang, Lanarkshire: **Mr. H. D. Vigers,** F.C.A. (secretary, Hoover, Ltd.), and **Mr. C. J. Hodges** (works manager, Hoover (Electric Motors), Ltd.). To be directors of Hoover (Washing Machines), Ltd., Merthyr Tydfil, Glam.: **Mr. F. A. Austin** (works manager, Hoover (Washing Machines), Ltd.) and **Mr. H. J. Furness,** F.C.W.A. (commercial research manager, Hoover, Ltd.).

Mr. J. L. Sadd, formerly major appliance service manager of Morphy-Richards, Ltd., has been appointed home sales office manager at 50, Conduit Street, London, W.1. **Mr. C. L. Brooks,** from the company's sales office, is now representing Morphy-Richards in the South Wales and South-Western territories.

Mr. G. S. G. Blunt has joined the technical sales staff of the Process Control Division of Bailey Motors & Controls, Ltd.

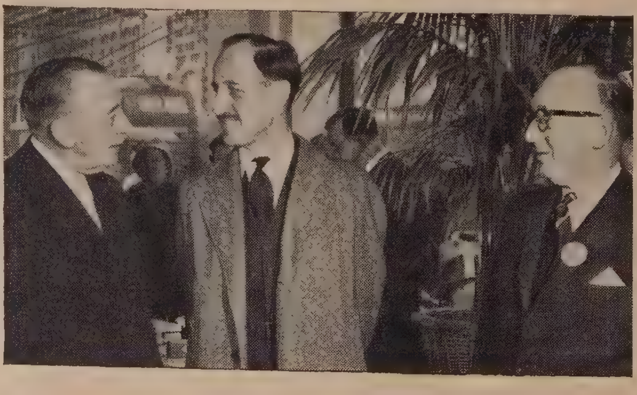
Mr. G. Wright, A.M.I.E.E., A.M.I.Mech.E., has been appointed chief engineer of Electrothermal Engineering, Ltd.

Mr. E. J. Hudson

Mr. E. J. Hudson, M.B.I.M., has been appointed divisional manager of the General Services Division of the Plessey Co., Ltd., Swindon region. He joined the company last year as group cost controller and he was previously director and works manager of Jackson Industries, Ltd. Earlier he was with the Brush Electrical Engineering Co., Ltd., as chief purchasing officer.

Under the reorganisation of the sales department of Belling & Lee, Ltd., **Mr. R. M. Prevett** has been appointed assistant sales manager (internal) and **Mr. R. W. Elliott** becomes assistant sales manager (field) of the new industrial sales division. **Mr. L. R. Dunlop** is appointed assistant sales manager (internal) and **Mr. H. J. Walters** assistant sales manager (field) of the new domestic sales division. The sales development department has also been reorganised. **Mr. E. M. Randall** continues as advertising manager (domestic) and **Mr. G. F. Redgrave** has been appointed advertising manager (industrial).

Long & Crawford, Ltd., announce that coincident with the acquisition of its shares by Lloyds Packing Warehouses (Holdings), Ltd., **Mr. Ernest Long,** A.M.I.E.E., retired as chairman at the age of eighty-six, having served in this capacity for forty-nine years.



Sir Leslie Gamage, chairman of the G.E.C. (left), welcomes Captain T. O'Neill, Ulster Minister of Finance, to the new G.E.C. building in Belfast. Mr. J. McK. Stewart (right) is manager of the branch. (See p. 494)

His services are being retained as technical adviser to the company. **Mr. E. K. Long** and **Mr. P. W. Long** remain on the board.

For the second successive year a team from Barnstaple (North Devon) has won the men's trophy in the finals of the annual **South Western Electricity Board** First Aid Competition held at Exeter on 27th February. A team from Pool (Cornwall)—Redruth No. 1—won second place. The women's cup went to a team from Electricity House, Bristol. The trophies were presented by Mr. A. N. Irens, chairman of the South Western Electricity Board. Mr. E. M. Hughes, deputy secretary of the Board, who is chairman of the organising committee of the competition, presided.

The annual dinner of the Meter Engineers' Technical Group of the **Electrical Power Engineers' Association** will be held on 8th April (6 for 6.45 p.m.) at Palmerston Restaurant, 49, Bishopsgate, London, E.C.2.

Mr. J. E. Smith, managing director of the National Gas & Oil Engine Co., Ltd., has been elected to the board of Mirrlees, Bickerton & Day, Ltd.; both companies are members of the Hawker Siddeley Group.

Mr. T. D. Childs, M.B.E., has been appointed Scottish manager for Dorman & Smith, Ltd., and D. S. Plugs, Ltd. He was Scottish representative for the company until his new appointment and will operate from 73, Robertson Street, Glasgow.

Mr. T. D. Childs

Mr. J. Burnett, commercial officer in the Fife Area of the South of Scotland Electricity Board since 1948, retired on 27th February after thirty-nine years' service to the industry in Fife. He began his career as an electrical engineer with the Fife Coal Co. at Leven, and in 1920 joined the Fife Electric Power Co., with whom he became consumers' engineer.

Dr. William A. Prowse, senior lecturer in applied electricity at Durham University, has been appointed to a Readership in Physics at the University.

After serving nearly fifty years in the electricity supply industry, **Mr. F. J. Hoyte,** A.M.I.E.E., rural development engineer in the Leicestershire and Warwickshire Sub-Area of the East Midlands Electricity Board, retired on 31st January. Mr. Hoyte was articled to the borough electrical engineer of Nuneaton in 1911. After brief periods with the British Thomson-Houston Co., Ltd., at Coventry and with the Yorkshire Electric Power Co., he served in the R.N.V.R. in the 1914-18 war. On demobilisation he studied for three years at Loughborough College, and later served with Nuneaton Corporation and the Leicestershire and Warwickshire Electric Power Co.

Sir John Wrightson, Bt., chairman of Head Wrightson & Co., Ltd., left by air for South Africa on 2nd March. He will visit the company's works in Johannesburg. Sir John will return home at the end of March.

Mr. G. O. Allerston, A.M.I.Mech.E., has been appointed deputy education manager of A.E.I. (Woolwich), Ltd. He was formerly education manager of W. T. Henley's Telegraph Works Co., Ltd.

Mr. W. M. Lee, Glasgow, has been appointed deputy chairman of the Electricity Consultative Council for the South of Scotland District. He succeeds **Sir Maxwell Inglis,** Bt., who is now chairman of the Council.

Mr. D. D. Shears, superintendent of Skelton Grange "A" power station, Yorkshire Division, C.E.G.B., has been appointed superintendent of both the "A" and "B" stations.

At the luncheon meeting of the **Electrical Industries Club** on Tuesday last Mr. C. R. King, president, was in the chair and introduced the guest speaker, Sir John Woods, G.C.O., M.V.O., an executive director of the English Electric Co., Ltd. Sir John, who was formerly Permanent Secretary to the Board of Trade, spoke about the export trade of the heavy electrical engineering industry under the title "Reflections of an Electrician's Mate." The next Club luncheon will be on Tuesday, 12th April, when the guest speaker will be Lord Mancroft; it will be preceded by the annual general meeting at 11.45 a.m.

OBITUARY

Mr. Arthur Richard Knowles, C.B.E., secretary to the B.E.A.M.A. Overseas Division, died on 28th February at the age of sixty. After holding a commission in the Royal Flying Corps during the 1914-18 war, Mr. Knowles became a China merchant, and was honorary secretary of the British Chamber of Commerce in North China.

After returning to the United Kingdom, Mr. Knowles was appointed the first director of the Joint Iron Council and later was secretary-general of the Association of British Chambers of Commerce.

Mr. Knowles joined the B.E.A.M.A. in 1958 as export secretary, becoming secretary of the newly formed Overseas Division in October last year.

Col. Sir John Kent.—The death occurred on 5th March, at the age of eighty-two, of Col. Sir John Kent, C.B.E., D.L., J.P., O.St.J., a director of Taylor Tunnicliff (Electrical Industries), Ltd., and formerly chairman of Taylor Tunnicliff & Co., Ltd. Sir John was well known in the pottery industry, being chairman of the National Council of the Pottery Industry in 1926 and president of the British Pottery Manufacturers' Association in 1950. Earlier in his career he served in the Royal Artillery and was commissioned as 2nd lieutenant in 1899. He served throughout the 1914-18 war, attaining the rank of lieutenant-colonel; in 1945 he became hon. colonel. Sir John had been prominent in the industrial and civic activities of the Potteries area, having been president of the North Staffs. Chamber of Commerce in 1933; chairman of the Stoke-on-Trent Employment Committee in 1945; county controller, Staffs., Civil Defence, 1940-45; and High Sheriff of Staffordshire in 1942. He became a member of the Midlands Electricity Consultative Council in 1950. He had also been chairman of Electric & Ordnance Accessories, Ltd., and a director of Electric Transmission, Ltd.

The late Col. Sir John Kent

Mr. Frederick G. Chitty, sales director of Electrix, Ltd., died in hospital, after a short illness, on 5th March at the age of sixty-three. He joined Electrix, Ltd., in 1935 and was appointed a director three years later.

Mr. W. Monro Smith, A.M.I.E.E., former liaison officer, system operation, of the London Division, Central Electricity Generating Board, died on 3rd March. He retired in August last year.

Mr. F. C. Fenton.—A memorial service for the late Mr. F. C. Fenton, O.B.E., chief commercial officer, London Electricity Board, will be held at St. Michael's, Cornhill, on Monday, 14th March, at 12 noon.

Financial Section

STOCKS and SHARES

A CONTINUANCE of subdued conditions in almost all sections of the Stock Exchange was thought to reflect preoccupation with the possibility of further measures to counteract inflationary tendencies arising from such developments as the proposed railway wage increases, coupled with the still growing volume of Government expenditure, bank advances and hire-purchase debts. So far as the approaching Budget is concerned, earlier hopes of tax concessions seem to have been largely replaced by conjecture on whether the Chancellor will find it necessary to reinforce the steps he has already taken to control the rate of expansion. Company and profits statements, now appearing in increasing numbers, have to be uncommonly good to strike a spark from these rather inert markets, and most of the significant price movements have again been associated with merger negotiations.

Lower Prices

Shares of the major electrical groups, and of some of the heavy engineering firms associated with them, continued to be regarded cautiously in view of the contracting tendency of profit margins in these industries, as evidenced recently in annual reviews by the chairmen of English Electric and International Combustion. English Electric at 41s 9d and G.E.C. at 38s 9d showed further losses of about 1s at the beginning of this week. Crompton Parkinson had come back to 13s, while C. A. Parsons, at 48s 9d, and Reyrolle, at 97s 6d, had each shed 3s. Among domestic equipment issues, Hoover at £5 lost the rise induced in the previous week by news of the almost doubled profits and increased dividend, while Morphy-Richards, at 39s 3d, also retraced some of the ground gained earlier as a result of the company's proposals for a scrip issue and a larger interim payment.

Firm Features

While the week's price changes again showed a majority of losses, firm features were by no means lacking in the electrical equipment market. Plessey continued on the up-grade to 50s, and are now among the few shares still quoted at around their highest 1959–60 levels. Aron Meter have also been noticeably well supported; at 55s they showed a gain of 5s in a fortnight. Telegraph Condenser improved again, by 1s 3d, to 61s 3d. There were advances of 1s 6d in Contactor Switchgear to 17s 6d, and of 1s in Walsall Conduits to 16s, while Chloride Electrical Storage were firm at 67s 6d. Elliott-Automation and Cable & Wireless are now both quoted ex the 20 per cent scrip issues, the latter ex a "rights" issue also.

Price Changes in

Company or Board	Nom. Value	Middle price 7th Mar.	Week's Rise or Fall	Dividend Pre-vious	Dividend Last	Yield %	1959 High-est	1959 Low-est
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	76½	−½	3	3	3 18 6	81	77½
Brit. Elec. 1974/77	100	73	−½	3	3	4 2 3	78	74½
Brit. Elec. 1976/79	100	77½	−½	3½	3½	4 10 3	81	77½
Brit. Elec. 1974/79	100	86½	−½	4¼	4½	4 18 3	91½	87½
Overseas Electric Supply								
Calcutta Elec.	£1	20/-		6·8†	7†	11 8 0	20/-	16/-
East African Power	£1	18/-	−1/-	7½	8	8 18 0	22/6	19/3
Nigerian Elec.	£1	19/-		8	8	8 8 6	19/-	13/-
Perak Hydro-Elec.	£1	15/6	−1/-	10	5	6 9 0	17/-	12/3
Electrical Shares								
Aberdare Holdings	5/-	18/-	−6d	17½	17½	4 17 3	18/9	15/6
Aerialite	1/-	8/9	−3d	54	54	6 3 6	12/3	7/9
Allen, W. H.	£1	58/9		11	12	4 1 9	58/9	43/-
Allied Insulators	5/-	23/-	−3d	—	20	4 7 0	23/6	18/9
Anglo-Portuguese Tel.	£1	26/6	−1/-	9	9	6 15 9	30/9	26/6
Aron. Elec. Ord.	£1	55/-	+1/3	15	15	5 9 0	62/6	45/-
Assoc. Elec. Ord.	£1	58/3	−6d	15	15	5 3 0	67/-	53/9
Automatic Tel. & El.	5/-	18/9	−1/3	17	17‡	4 10 9	21/9	18/-
Babcock & Wilcox	£1	42/6		13¾	13	6 2 3	52/6	43/-
Bakelite	10/-	41/6	−2/-	15	15	3 12 3	41/3	22/-
Baldwin, H. J.	2/-	2/3		20	—	—	3/-	2/-
Berry's Electric	5/-	35/9		10	20‡*	2 16 0	33/6	7/3
Bowthorpe Holdings	2/-	10/-	−3d	25	27	3 5 0*	11/3	8/-
British Elec. Traction:								
Def. Ord. "A"	5/-	43/6	−9d	25	35	4 0 6	49/6	35/6
B.I. Callender's	£1	53/6	−1/-	12½	13½	5 0 9	60/6	44/9
B.I. Callender's 6% Pref. ...	£1	20/6		6	6	5 17 0	21/-	19/9
British Thermostat	5/-	22/-		30	35	3 19 6*	28/-	18/6
Brook Motors	10/-	51/3		25	25*	4 3 6*	51/-	39/6
Bulgin, A. F.	1/-	13/3		45	50	3 15 6	13/9	6/9
Bulpitts	5/-	21/-	−3d	—	15	3 11 6	21/3	10/-
Burco Dean	5/-	14/9		16	18	6 2 0	19/6	12/3
Cable & Wireless:								
Ord.	5/-	15/6x.a.		10	10*‡	3 4 6	18/6	10/6
4% Loan	100	96		4	4	4 3 3	96	93
Chloride El. Storage "A" ...	£1	67/6	+9d	17½	20‡	3 19 0*	73/-	34/8
Clarke Chapman	£1	58/9	−1/3	13¾	13¾	4 13 6	66/3	52/6
Cole, E. K....	5/-	28/3		17½	20	3 10 9	27/6	17/3
Contactor Switchgear	5/-	17/6	+1/6	14	14	4 0 0	16/9	12/-
Cossor, A. C.	5/-	8/3	−3d	Nil	5	3 0 6	9/6	6/3
Crabtree	10/-	53/9	−1/-	20	22½‡	4 3 9	54/-	28/-
Crompton Parkinson	5/-	13/-	−6d	12	14	4 6 0*	15/-	9/6
Davis & Timmins	5/-	23/6	−6d	18	20	4 5 0	22/-	14/6
De La Rue	10/-	71/3		17½	20	2 16 3	71/6	30/3
Decca "A"	10/-	47/-	−6d	50	20*	4 5 0	50/6	33/3
Desoutter	5/-	38/9		25	21⅜*	2 16 0	37/6	19/-
Dewhurst	2/-	7/9		20	20	5 3 3	9/6	7/3
Dictograph Tel.	2/-	12/-		20	20	3 4 0	13/6	7/-
Dimplex	5/-	29/6	−1/-	—	25‡	4 4 9	30/-	—
Dubilier Condenser	1/-	5/6	−6d	20	25	4 11 0	5/6	3/3
Duport	5/-	24/-	−6d	12½	17½	3 13 0	28/6	10/3
E.M.I.	10/-	51/6	−3/6	20	14*‡	2 14 6	56/6	31/6
Electrical Apparatus	5/-	13/3		14½	14½	5 9 6	16/6	13/-
Electrical Components	5/-	11/6		12½	15	4 7 0*	14/-	7/-
Elec. Construction	£1	40/-	−1/-	8½	9	4 10 0	37/-	27/9
Elliott-Automation	5/-	20/9x.c.	—	—	9·3*‡	2 4 9	25/6	14/-
Enfield Rolling Mills	£1	52/6	−1/-	12½	15	5 14 3	60/-	36/9
English Electric	£1	41/9	−1/3	14	10*	4 15 9	52/6	37/1
English Electric 3¾% Pref. ...	£1	12/9		3¾	3¾	5 17 9	13/6	12/3
Ericsson Tel.	5/-	24/9		12†	13†	4 5 9	28/-	22/3
Ever Ready	5/-	25/6	−6d	20	27½‡	3 5 0*	28/-	13/3
Falk Stadelmann	£1	33/6		10	10	5 19 6	35/6	25/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

Opening prices were 20s 9d and 15s 6d respectively in the new forms.

E.M.I. and Henry Simon

Erratic fluctuations have been recorded in shares of the companies concerned in the three-sided negotiations in which Electric & Musical Industries, Simon-Carves and Henry Simon (Holdings) are engaged. They were quoted respectively at about 48s 3d, 36s 3d and 32s 6d a week or two before the situation began to develop with the announcement that Simon-Carves and Henry Simon were discussing a closer association. Shortly after the intervention of E.M.I.'s offer of one of their 10s shares, plus 5s cash, for each Henry Simon share, the price of the latter was showing a net gain of 23s at 55s 6d, while Simon-Carves had risen to 48s 6d and E.M.I. to 51s 6d. At that level, the E.M.I. bid put a value of 56s 6d on the Henry Simon shares. Holders of the latter were then left to await the directors' comments on the alternative proposals before them.

Electrical Investments

Company or Board	Nom. Value	Middle price 7th Mar.	Week's Rise or Fall	Dividend		Yield %			1959	
				Previous	Last				Highest	Lowest
Electrical Shares—continued						£	s	d		
G.E.C.	£1	38/9	−1/-	10	10	5	3	3	48/-	31/3
G.E.C. 6½% Pref.	£1	22/-		6½	6½	5	18	3	23/-	20/3
General Cables	5/-	6/9		15	Nil		—		9/3	7/6
Goblin (B.V.C.)	5/-	11/6	−6d	7½	12½	5	8	9	13/9	4/6
Greenwood & Batley	£1	125/-		20	20	3	4	0	117/6	75/-
Hackbridge Holdings	5/-	15/3	−6d	20	20	6	11	3	19/3	14/3
Hackbridge & Hewittic	5/-	13/-	−9d	20	20	5	15	6*	15/6	10/6
Head Wrightson	5/-	22/9		20	14‡*	3	1	6	31/6	16/6
Heatrae	2/-	10/6	+6d	20	20	3	16	3	10/-	7/6
Holophane	5/-	20/6	−2/-	22½	26	6	6	9	20/-	14/9
Hoover	5/-	100/-	−10/-	60	90	4	10	0	103/9	55/-
I.C.I.	£1	61/6	+1/6	12	8*	2	12	0	61/6	33/-
Intl. Combustion	5/-	30/-	−1/6	30	30	5	0	0	43/6	29/9
Intl. Computers & T.	£1	64/6	−1/9	—	10	3	2	0	78/9	57/6
Johnson & Phillips	£1	22/-		5	5	4	11	0	30/6	18/3
Laurence Scott	5/-	20/9	−1/3	15	15	3	2	3*	18/9	14/-
Lister, R. A.	£1	60/-		12½	14	4	13	3	55/6	32/9
Lucas, J.	£1	73/9		10	12½	3	7	9	78/6	43/3
Marconi Marine	£1	46/3	+2/3	10	10	4	6	6	48/6	40/-
Marryat & Scott	2/-	15/-		37½	22½*	3	0	0	14/9	8/6
Mather & Platt	£1	52/6	−1/6	10⅜	11	4	3	9	52/-	41/3
Metal Industries	£1	71/3	−3/6	14	15‡	4	4	3	74/6	39/9
Midland Elec. Mfg.	£1	56/3		10	12	4	6	0	52/6	41/6
Morphy-Richards	4/-	39/3	−1/6	20	25	2	11	0	34/-	18/-
Murex	£1	65/-	−2/6	17½	15	4	12	3	76/-	42/-
Newman Ind.	2/-	4/-		10	10	5	0	0	3/6	2/3
Oldham & Son	1/-	3/-		17½	17½	5	16	9	3/3	2/6
Parsons, C. A.	£1	48/9	−3/-	7½	8⅛‡	3	6	9	58/9	45/9
Philips' Lamps	Fl.10	145/-	−1/3	14	14	1	16	6	160/-	88/-
Plessey	10/-	50/-	+1/3	20	14*‡	2	16	0	48/6	23/6
Pye	5/-	17/-	−6d	12½	12½*‡	3	13	6	20/6	13/-
Pyrotenax	5/-	48/9	−1/3	—	34	3	9	9	47/6	33/9
Radiation	£1	36/3	−2/-	5	6	3	6	3	43/9	24/9
Reliance Clifton	5/-	24/-		15	15	3	2	6	27/6	17/6
Reyrolle	£1	97/-	−3/-	17½	17½	3	12	3	98/-	85/9
Rheostatic	4/-	16/6	+3d	12½	20	4	17	0	18/6	8/3
Richardsons Westgarth	10/-	12/9	−9d	8⅓	8⅓	6	10	9	15/3	11/6
Simon-Carves	5/-	48/6	+6/-	25	25	2	11	6	37/6	28/6
Smith (England), S.	4/-	18/-		12½	17½	3	17	9	21/-	11/6
Southern Areas	£1	13/6		Nil	Nil		Nil		15/-	10/6
Strand Elec.	5/-	17/3	−1/-	15	20	5	16	0	19/3	8/6
Sturtevant	5/-	23/9		15†	15†	5	3	0	23/6	17/-
Sun Elec.	5/-	15/9		25	15*	4	15	3	16/9	8/3
Switchgear & Cowans	5/-	16/9	−3d	22½	15*	4	9	6	16/6	10/3
T.C.C.	10/-	61/3	+1/3	25	25	4	1	9	58/6	38/-
Telephone Mfg.	5/-	6/-		10	10	8	6	9	7/3	4/9
Telephone Rentals	5/-	17/-	−9d	12½	12½*	3	13	6	22/6	11/9
Thompson (John)	5/-	20/3	−9d	25	25	6	3	6	25/6	19/6
Thorn Elec.	5/-	45/-	−2/-	17½	20	2	4	6	56/3	26/3
Thorneycroft	£1	23/9	−1/3	7½	6	5	1	0	31/6	20/6-
Tube Investments	£1	66/6x.r.	−4/6	20	12½‡	3	15	3	—	—
Vactric	5/-	39/9		25	37½	4	14	3	46/6	26/3
Walsall Conduits	4/-	16/-	+1/-	22½	22½	3	4	0*	15/9	10/8
Ward & Goldstone	5/-	53/-	−6d	25	30	2	16	6	58/9	30/6
Watford	2/-	12/6		25	25*	4	0	0	14/9	7/6
Westinghouse	£1	51/-	−1/-	10	11	4	6	3	59/-	39/6
West, Allen	5/-	15/9		12½	11½*	3	12	9	15/6	11/9
Wolf Electric	5/-	11/3	+3d	10	10	4	9	0	11/9	7/9

T.I. Issue

Dealings began this week in the issue of over 16¾ million new £1 ordinary shares offered to Tube Investments shareholders at a price of 25s. Early transactions took place at a premium of 41s 6d, the old shares being quoted at 66s 6d "ex rights." Involving some £21 million new money, the prospect of this operation has weighed heavily on the market since last month's preliminary notice, shortly before which they stood at 125s (having been up to 139s earlier in the year). They were down to 112s 6d when the allotment letters went out, and the subsequent "ex rights" quotation represented a further decline. On the increased capital the directors have forecast a final dividend later in the year of not less than 8¾ per cent, making a total equivalent to 12½ per cent, so that the prospective yield is approximately 3¾ per cent. For some weeks the new shares will be transferable free of stamp duty.

International Combustion

References to shrinking profit margins occurred prominently in the annual report of International Combustion Holdings. A decline in the group's earnings for the next two or three years was envisaged in the chairman's review on the grounds that the productive capacity of the industry had become greatly in excess of current demand. Trading profits in 1958–9 were moderately down on those of the previous year, which Sir James Reed Young said must clearly be regarded now as representing a peak in the steadily progressive growth in earnings since 1948. Having declined by some 6s, to 30s, since the appearance of the report, the 5s shares offer a yield of 5 per cent on the 30 per cent dividend.

Company News

Bruce Peebles are paying in effect the same dividend for 1959 as for the previous year (allowing for the intervention of the two-for-one scrip issue) but the price of the 10s shares was initially marked down from 32s 6d to

25s 6d on the disclosure of a net profit of £111,000, which is less than half the comparable 1958 figure. At this level they show a yield of nearly 4 per cent on the 10 per cent payment. Severe competition and the contraction of profit margins are among the factors mentioned in the company's statement as having contributed to the trading difficulties of last year. Thorn Electrical Industries are making a first allocation from the 100,000 ordinary shares set aside for issue to senior executives and staff. On this occasion shares are being allotted at 25s (the price at which last year's "rights" offer to shareholders was made). Allottees will not be permitted to dispose of their shares for a period of three years.

REPORTS and DIVIDENDS

Hoover, Ltd.—The financial results for 1959 were published in our last issue. With the report and accounts now issued, the company has circulated its review of the past year. This states that the favourable economic conditions at home, coupled with the more favourable economic trends abroad, have enabled the group to expand export trade, and the turnover for the year is 50 per cent higher than in 1958 and the profits of £11·1 million are the highest in its history. Although turnover is up by 50 per cent, profit shows a much greater proportional increase, illustrating the importance of volume in the profit structure. The rapid and sustained expansion of demand for domestic products which followed the removal of credit restrictions created conditions in 1959 which enabled all the advantages of continuous high volume production to be attained and has made it possible to reduce prices considerably for many models on the home market. More important still, it has provided the opportunity to lower prices in the highly competitive markets abroad and export business has, in consequence, shown a material increase.

The company have increased their share of the competitive home market; sales of the "Junior" cleaner have attained a very high level and those of the new "Major" model have been well up to forecasts. A redesigned "Constellation" cleaner was introduced in October last and, at the same time, a substantial reduction was made in the price. The combination of high quality and low price has had a favourable effect on sales. During the autumn considerable price reductions in both hand and power wringer washing machines were made, which have stimulated even greater sales of both these products.

Referring to the increasing competition in this country from foreign washing machines, the review says that some indication of the extent of foreign competition can be gathered from the fact that approximately 10 per cent of all sales of washing machines and 8 per cent of vacuum cleaners are of foreign manufacture. The total turnover of the company in the export market rose by 18 per cent, while in the dollar countries the downward trend evident in 1958 halted and earnings in this field in 1959 increased to $3,062,450 as compared with $2,216,236 in 1958. During the year the company exported nearly 80 per cent of all cleaners and washing machines shipped from Britain. A new company, Hoover S.A., has been formed in Switzerland to exploit the opportunities afforded by the European Common Market development, and a management team, with Continental background and training, is being built up and will concentrate its activities on the special aspects of this market.

The demand for Hoover products in 1959 reached new heights and taxed production resources to the limit, making it evident that considerable extensions will be necessary in all the factories. The provision of some 375,000 sq ft of modern factory was the first move in the plans to provide space for the future. It is not expected that the rate at which sales climbed in 1959 will be repeated in 1960. Competition is becoming more intense in both home and export markets and in the home market imports from overseas have increased at a significant rate and have added their weight to the pressure of home competition. All this can only mean keener prices and lower profit margins.

Bruce Peebles & Co., Ltd., report that after providing for taxation, the net profit for 1959 is £110,655, as compared with £226,305 for the previous year. The dividend for the year is 10 per cent on capital trebled by a scrip issue and is equivalent to that paid for the previous year after allowing for the scrip issue.

E.M.I. Bid for Henry Simon.—Electric & Musical Industries, Ltd., is making an offer for the capital of Henry Simon (Holdings), Ltd. For each of Henry Simon 5,140,500 ordinary 5s shares E.M.I. is offering one of its 10s ordinary shares, plus 5s in cash. For the 716,550 6 per cent cumulative preference shares of £1 each in Henry Simon, the offer is 50 E.M.I. ordinary 10s shares for every 100 preference shares. Acceptance on the proposed terms would involve £1,285,125 in cash and the issue by E.M.I. of 5,498,775 ordinary 10s shares.

The directors of Henry Simon state that they are not prepared to comment on the offer pending the outcome of talks now in progress with Simon-Carves, Ltd., who, with Henry Simon, are the parents of a number of engineering companies which form the Simons Engineering Group. Simon-Carves has already advised its shareholders not to sell while the negotiations are in progress.

Cambridge Instrument Co., Ltd.—The trading profit for 1959 amounts to £482,709 as compared with £474,389 for the preceding year, and after providing for taxation the net balance is £256,965 (against £216,515). It is proposed to pay a final dividend of 2½ per cent, making 12½ per cent, tax free, for the year. A first quarterly dividend of 4 per cent, less tax, is declared for 1960.

New Companies

Lancashire Dynamo Construction, Ltd.—Registered 25th February. Capital £100. Electrical, mechanical, hydraulic and general engineers, etc. E. J. Daws signs as director. Regd. office: 229, High Street, Acton, W.3.

British Batteries Overseas, Ltd.—Registered 19th February. Capital £1,000. Investment holding company, etc. Directors: E. Powell (director of Chloride Batteries, Ltd., etc.), T. Dawson, D. G. Cochrane, J. Masterton (director of Joseph Lucas (Batteries), Ltd., etc.), E. W. Spracklen and H. D. Spottiswoode. Regd. office: 77, Bedford Court Mansions, Bedford Avenue, W.C.1.

Bankruptcies

C. W. Hales, lately carrying on business at Robden, Hoyal Road, Hamworthy, Poole, Dorset, and at 2, Lake Road, Hamworthy, Poole.—Application for discharge to be heard on 6th April at the Law Courts, Stafford Road, Bournemouth.

J. A. Haigh, electrical engineer, trading as R. F. Haigh, 8, Newtown Street, Colne.—Receiving order made 15th February on debtor's own petition. Public examination 12th April at the Court House, Bankhouse Street, Burnley.

L. C. Sampson and **E. C. Tubb**, trading in co-partnership under the style of Electro Radio Stores at Fore Street, Gunnislake, Cornwall, electrical and television dealers.—Last day for receiving proofs for dividend 16th March. Trustee, Mr. H. Evans, 2, Serjeants' Inn, London, E.C.4.

Elite Electrics.—In our last issue the name of this firm was incorrectly given as Elite Electrics, Ltd.

Liquidations

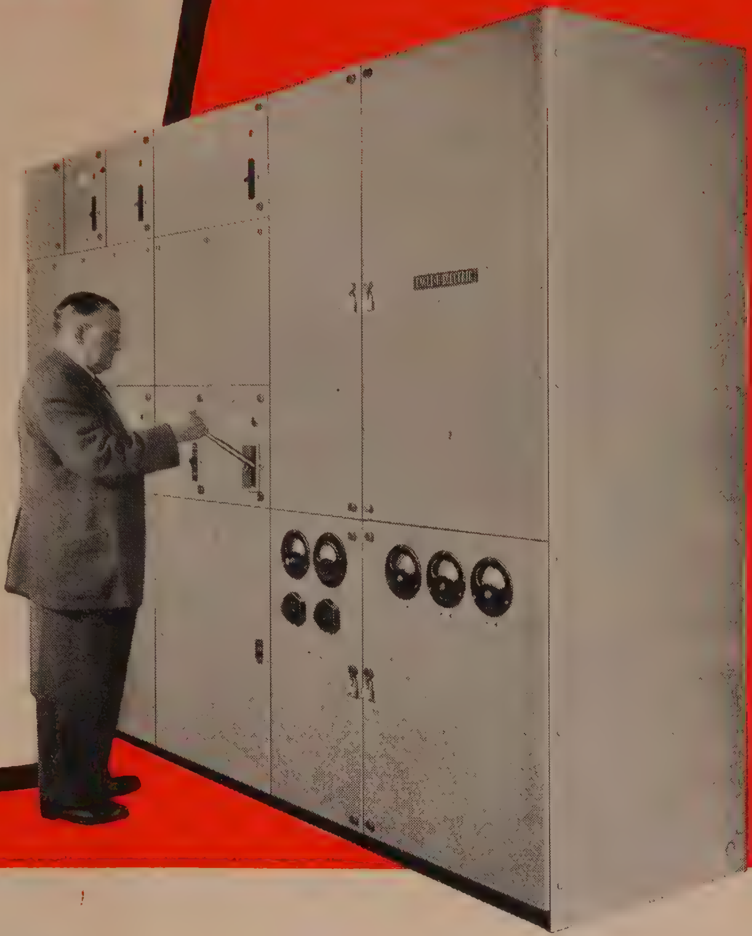
Hanwell Electrical Supplies, Ltd.—Particulars of claims by 29th March to the liquidator, Mr. A. W. Hunter, Walter House, 418-422, Strand, London, W.C.2.

Grafton Heater Co., Ltd.—Particulars of claims by 21st March to the liquidator, Mr. F. N. Phipps, Phipps & Co., Bank Chambers, 329, High Holborn, London, W.C.1.

JOINT SWITCHBOARD INSTALLATIONS

REDUCE COSTS IN INDUSTRIAL SUBSTATIONS

The illustration shows a composite 'Superform' switchboard installed in the substation of a large warehouse in the Midlands. The switchboard accommodates both the Supply Authority's open type substation equipment and the outgoing circuits to the warehouse within the one unit. The busbars of the substation board and outgoing 'Superform' section are coupled together, both electrically and mechanically, making the composite Switchboard a complete entity.



THE BASIC ADVANTAGES OF THIS NEW DESIGN ARE—

- ★ Compact arrangement with economy of space
- ★ Saving in building costs
- ★ Saving in installation costs
- ★ Attractive appearance of the installation

Plus

The latest exclusive technical features of 'English Electric' 'Superform' Switchboards and Open Type Substation Distribution Equipment.

For further details write to:
The ENGLISH ELECTRIC Company Limited, Fusegear Division, East Lancashire Road, Liverpool, 10

'ENGLISH ELECTRIC'

'Superform' Switchboards

The ENGLISH ELECTRIC Company Limited, Marconi House, Strand, London, W.C.2.

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

FG.46

IT'S THE COOKER FOR HER!

The Belling 48T is your customer's dream of a perfect cooker come true. We designed it after questioning thousands of women at exhibitions and demonstrations. It has been built to the highest specification, with a galaxy of easy-to-use and easy-to-clean features. So tell your customers about it and display it where it can speak for itself.

EXCLUSIVE REMOVABLE OVEN ROOF AND LINING

THE TEN TOP FEATURES OF THE BELLING 48T

- Eye-level controls.
- New Smith's Auto-timer and Electric Clock.
- Lift-off oven door and inner glass door.
- Automatic oven lighting.
- Large hot-cupboard with drop-down door.
- Fast-boiling 8″ Radiant plate.
- Handy drawer for warming and storage.
- Chromium plate trims and bumper bar.
- Rollers at back for easy moving.
- Vitreous enamel throughout, including hob, door panels and side panels.

"Belling"

48T £51

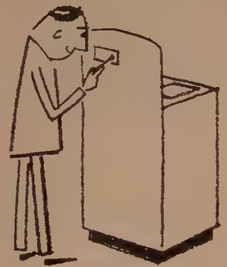
SEE THE BELLING BOOK FOR THE FULL EXCITING STORY OF THE 48T

IT'S THE COOKER FOR YOU!

See us at:—

IDEAL HOME EXHIBITION
E.D.A. SALES CONFERENCE
and A.S.E.E.

When we say this is the cooker for you we mean it's easy to handle, easy to install and easy to sell. And it's built the Belling way — to last! The whole front frame is a one-piece iron casting and the whole cooker inside and out is vitreous enamelled to ensure long life without any fear of fading, discoloration or peeling.

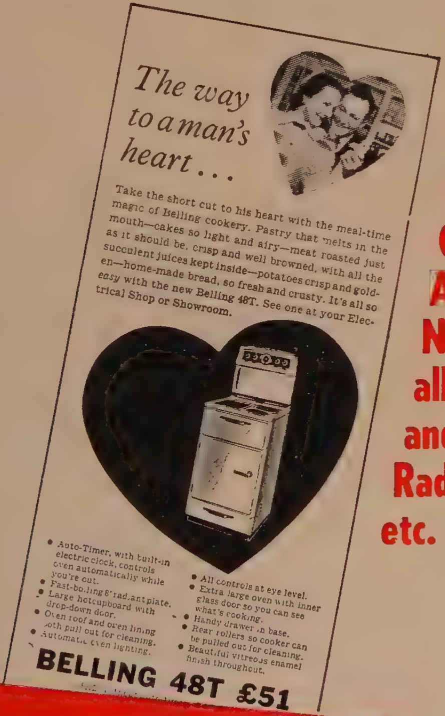


NO ASSEMBLY NEEDED. Delivered complete with control panel already fitted and wired — no need for you to do any assembly work.

EASY TO INSTALL. Simply remove the small inspection panel on the back to gain access to the mains terminals. No need at all to remove back or sides.

EASY TO SELL. As soon as we are able to meet the present demand we're putting a really big advertising broadside behind this outstanding new model to bring you extra customers, and cooker catalogues produced in full colour will be sent to you shortly.

BETTER SHOWROOM DISPLAY. The back panel is white or cream to match the rest of the cooker, so that it gives a neat and tidy appearance to the back of your window display.



The way to a man's heart . . .

Take the short cut to his heart with the meal-time magic of Belling cookery. Pastry that melts in the mouth—cakes so light and airy—meat roasted just as it should be, crisp and well browned, with all the succulent juices kept inside—potatoes crisp and golden—home-made bread, so fresh and crusty. It's all so *easy* with the new Belling 48T. See one at your Electrical Shop or Showroom.

- Auto-Timer, with built-in electric clock, controls oven automatically while you're out.
- Fast-boiling 8" radiant plate.
- Large hotcupboard with drop-down door.
- Oven roof and oven lining both pull out for cleaning.
- Automatic oven lighting.
- All controls at eye level.
- Extra large oven with inner glass door so you can see what's cooking.
- Handy drawer in base.
- Rear rollers so cooker can be pulled out for cleaning.
- Beautiful vitreous enamel finish throughout.

BELLING 48T £51

THIS STRIKING ADVERTISEMENT APPEARS IN HUNDREDS OF MORNING, EVENING AND WEEKLY NEWSPAPERS, and in all the principal Home and Women's Magazines, Radio Times, Punch, etc.

"Belling"

48T £51

48AB (without Auto-Timer) **£45 15. 0.**

BELLING & CO. LTD. • ENFIELD • MIDDLESEX

A If you are worried about the payroll and your mind jumps to the kind of gentleman shown above — ask a policeman.

If you are thinking of circuit-breakers—the J. & P. Type PDB arc-control oil circuit-breaker is undoubtedly the right answer.

This breaker achieved a remarkable performance during tests and, although designed for the more usual distribution duties of 250 MVA at 11 kV, it is certified for a breaking capacity of 350 MVA at 11 kV—a margin every engineer will appreciate is safe.

The TYPE PDB OIL CIRCUIT-BREAKER

★ has certified breaking capacities of
  350 MVA at 11 kV
  250 MVA at 6·6 kV
  150 MVA at 3·3 kV

★ has current ratings of 400A, 800A and 1200A.

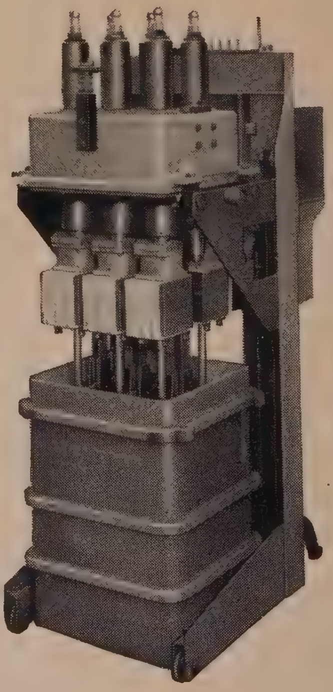
★ is designed for use in standard metalclad gear only 1′ 9½″ wide.

★ is available at very competitive prices.

★ has had each phase successfully tested to earth separately at full power.

★ has the arc confined to the arc-control device at all short-circuit ratings, even down to 2½% of full rating.

★ has porcelain bushings on the 400A and 800A unit even for 350 MVA duty.



When thinking of SAFE CIRCUIT-BREAKERS—ask J. & P. !

Publication SG 115 tells you all about them.

JOHNSON & PHILLIPS LTD.

CHARLTON, LONDON, S.E.7

SPECIALISTS IN THE TRANSMISSION, TRANSFORMATION & CONTROL OF ELECTRICITY

MANAGEMENT OF RESEARCH

"RESEARCH is too serious a matter to be left to the scientists. Managerial judgment and business acumen are vital qualities in the management of research and the leaders of Government and industry have to apply their minds as much to the problems of research as to any other subject." This was stated by Lord Nelson, chairman of the English Electric Co., Ltd., in a paper presented to the 1960 International Congress of Scientific Management in Melbourne, Australia. The paper was read by Mr. E. C. Fox, managing director of the company's Australian subsidiary.

Lord Nelson said that the main conclusion that could be drawn from his survey of some of the problems that faced those who were concerned with the management of research was that research was an integral part of modern industry. "Every industrial concern is affected by the results of scientific research and managements must be aware of its impact. It is not an activity which can be regarded as so specialised that managers in other fields can ignore it."

Expenditure per graduate employed was, Lord Nelson said, remarkably constant and so by controlling the number of qualified research workers it was possible to control the expenditure within comparatively narrow limits. Budgeting then largely consisted of allocating the time of qualified workers between different fields of study. In the electrical industry the importance of innovation was greater than was often realised. One large electrical firm had calculated that 60 per cent of its sales in 1957 were of goods not even heard of in 1947. If the year 1930 had been taken, the share would have been no less than 90 per cent.

In his own company, Lord Nelson revealed, they believed that the best balance was achieved when expenditure on basic research and on special investigations into specific problems submitted by other departments of the company was about equal. Research commissioned by outside bodies, which fluctuated widely, should be of the same order of magnitude. In general terms, basic research expressed as a ratio of all applied research carried out in the company was of the order of 1 : 10.

With some projects, such as guided missiles, atomic power reactors and high-voltage d.c. transmission, the research programme extended over many years. In providing a budget, it was essential to envisage the progressive nature of the work. There was no doubt that many projects in the defence and capital goods fields had suffered from the tendency of governments to handle research and development within the framework of an annual budget which fluctuated with the country's economic state.

Referring to the appropriate method of charging for research, Lord Nelson said it might be argued that a major British electrical company could not expect to obtain business in steam turbines and large generators unless it was in the atomic reactor field. In the same way equipment for d.c. transmission was never likely to be a large business in itself but it might influence the placing of large contracts which would involve the supply of many of the company's standard products. According to this view research and development in these particular fields should be a charge on the business as a whole. This was an argument fraught with danger—in particular one might lose money on research on one product merely to provide work for somebody else on another product. In practice most research projects must be made self-supporting.

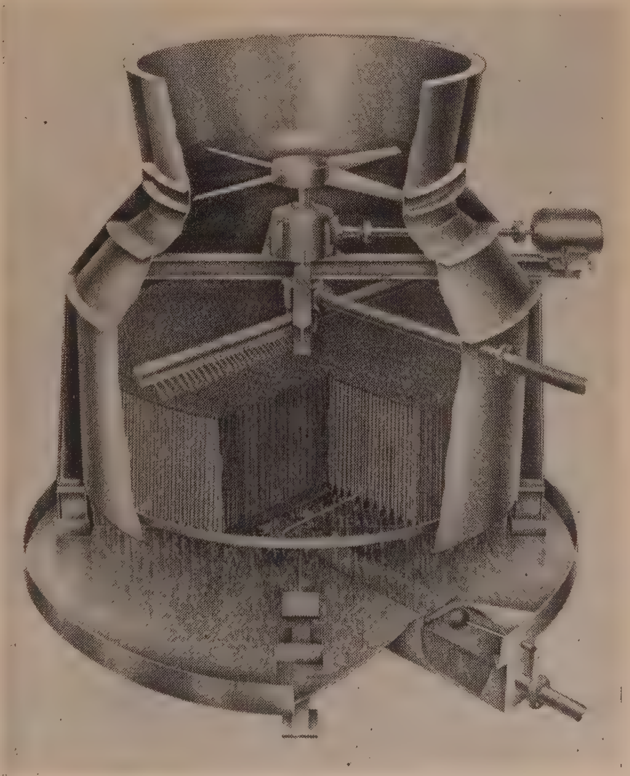
New Type of Cooling Tower

COOLING towers with fabricated steel structures and operating weights of less than half that of conventional towers are now being marketed by Thermotank, Ltd., Helen Street, Glasgow. The saving in weight, and in size, is achieved by the use of a honeycomb fill material in which the water is cooled by a counter-current of air as it passes through very closely spaced elements.

The cylindrical tower contains a top-mounted fan which draws the surrounding air up through it from the bottom. The fill is arranged with the channels disposed vertically and the water, which enters the tower from the top, is distributed across the surface of the fill by a centrally mounted rotating header pipe. The fill is made from alternate flat and corrugated sheets of a plastic-impregnated cellulose material which has a high "wettability." The water adheres to the walls of the channels and passes down in a thin film, allowing a free passage for the upper air currents. Since the film of water is continuously maintained, any foreign matter remains in suspension in the water and is drained away, thus preventing choking.

The prevention of capillary action, which would block the flow of air through the channels, is accomplished by serration of the lower face of the fill. This breaks the capillary bond and allows the water to run easily off the tips of the fill. The plastic impregnation of the fill material provides resistance to rotting and chemical degradation.

The largest single cell unit in the present range has a capacity of 90,000 gal/hr from 87°F to 75°F. This unit has a diameter of 20ft, a height of 12ft and a total weight of $12\frac{1}{2}$ tons. Multi-cell units are also available for capacities in excess of 90,000 gal/hr.



Cut-away drawing of Thermotank cooling tower

Electrical Appliances for the Home

Many New Models Exhibited at Olympia

THE *Daily Mail* Ideal Home Exhibition can usually be relied upon to provide one or two surprises in the nature of new items of domestic electrical equipment and this year's event, which opened last week at Olympia, London, and continues until 26th March, is no exception. Impressions gained as a result of a visit are the increasing number of refrigerators that are now available; the high functional efficiency combined with low prices of the latest electric cookers; and the seemingly endless number of smaller electrical domestic appliances that are being produced. Manufacturers have obviously been quick to cater for the increased demand, which has been reflected in Area Boards' sales figures during the past twelve months.

A visit to the British Electrical Development Association's stand, where nearly 150 different items are on view, is well worth while for any potential buyer of electrical appliances. Cooking, water heating, laundry, refrigeration, space heating —all aspects are represented—as well as a special display setting out the merits of electric floor warming. Visitors will also notice that many of the appliances are, or can be, thermostatically or time switch controlled. Many of the exhibits are shown for the first time and several are either new or recently introduced items.

Of special interest is a protoype of a future development of the "Creda" "Mercury Four" cooker, which incorporates in the oven a rotary spit. One of the advantages of this "Rosta-Spit" is that it can be used in free air or with the glass door closed, as desired. Another feature of this cooker, which will be available next July, is its low price—55 gns. Other cookers in the "Creda" range can be seen on the company's own stand. These include the standard version of the "Mercury Four," a four-plate luxury cooker with inner glass oven door, oven light and timer controlled oven and warming drawer. The price is 49 gns.

Simplex recently entered the refrigerator field and they take the opportunity to show the new "Creda 300" and "Creda 475" refrigerators. The internal layouts of both these models have been arranged to provide the maximum storage space within the minimum outside dimensions. The design shows current, yet dateless, styling—doors which open within their own width and recessed handles. Also new is a portable 1 kW radiator. It is thermostatically controlled and the design allows for a metal plug to be substituted for a thermostat dial and the temperature can be limited in such a way that it is impossible for it to be increased. The price, including tax, is just under £10. Another new heating appliance is the "Cresta" 2 kW reflector fire available in red, cream or beige. The price of this model, including tax, is £3 19s. Other well-known "Creda" appliances shown include the "Corvette" wall mounting water heater and the "Debonair" spin dryer.

New developments have been incorporated in the "Marquis" and "Viscount" electric cookers to be seen on Tricity Cookers' stand. The most noticeable feature is that 7in high-speed radiant plates have now been adopted as standard and the grill is completely independent. Following last year's experimental showing of the Tricity "Built-In" cooker, the design has been modified and it now appears in a production version. Basically, it comprises two independent units: the oven and hotcupboard grill assembly; and a surface unit with four radiant hotplates and separate control panel. The units can be installed in any desired position or height and there is, in fact, nothing to prevent their being situated in different parts of the kitchen. Colour schemes available are white or ivory with blue or pink facia panel and the complete cooker, together with made-to-measure kitchen furniture, can be purchased at an inclusive cost of £150. The "Four-point-Two" refrigerator, the first to be produced by Tricity, is also on show. As its name indicates, it has a capacity of 4·2 cu ft and is priced at 63 gns, including tax.

Another company which manufactures both cookers and refrigerators is the English Electric Co., Ltd. The accent, however, is on the new "Liberator" automatic washing machine and three new refrigerators. The "Liberator" has a built-in six-wash programme providing a choice of washing, rinsing and spin sequences suitable for all types of fabrics. A fully mobile machine, it is small enough to be fitted beneath a draining board and will operate from a cold water supply as it is fitted with an immersion heater. Press-button defrosting and temperature control are standard refinements incorporated in two of the new refrigerators, the "7103" (7·7 cu ft) and the larger "7104" (9·4 cu ft). The third and smallest model, the "7505," is only 32in high and has a capacity of 2·6 cu ft. A plinth is available as an optional extra to bring the model up to standard table height.

English Electric cookers exhibited feature quick-boil "Veeline" radiant hotplates with simmer controls, timer switches, oven lights, inner glass doors, etc.

The General Electric Co., Ltd., have two stands. At one they exhibit refrigerators ranging in size from 2½ to 8 cu ft. The latest model is the "Fabulous Four" table top refrigerator fitted with the "Slide-o-Matic" hinge which allows the door to open within the cabinet width. On the other stand electric cooking is the main theme and the new two-plate "Splendid" cooker, with eye-level grill, glass door and a storage drawer can be seen in company with "Superb," "Supreme" and "Quality" cookers. Electric kettles, toasters, percolators, etc., complete the display.

To meet the requirements of housewives who prefer their cooker oven to be as high as possible without wasting space, Belling & Co. have produced the "Classic 70." This new-styled cooker has the oven placed on the left and the boilng plates, grill and hotcupboard on the right. There are four boiling plates, and both the cupboard (below the grill) and the storage drawer (below the oven) are heated. Automatic oven control, removable oven lining and roof, oven lighting and glass door are all included in the price of £82. There is also a new version of the Belling "Classic" cooker, the "Classic 60," fitted with four radiant plates and a separate radiant grill in the hotcupboard. This model is priced at £69 10s.

Several other cooker manufacturers are represented at the Exhibition, including the Electrical Division of Radiation, who show their recently introduced "Highline" and "Estate" cookers, and the Revo Electric Co., Ltd., newcomers to the Exhibition. The last-named company are exhibiting their "Revo-Luxe" remote control cooker (£51 10s with remote control timer) and the "Family

Revo "Jobber" power tool

Kenwood "Wastemaster" waste disposal unit

Special" (timer model £44 10s, including glass door). Other Revo products exhibited include the recently introduced "Jobber" electric drill, which is demonstrated daily. This drill, for which a number of attachments are available, was originally only obtainable in the Midlands but has now been launched in London and the South of England. The Revo range of convectors and fires on view has been restyled.

Bendix is a name which has for many years been associated with washing machines and several types are, of course, on show on their stand, including the new "Gyramatic" and "Dialamatic" models, now with built-in immersion heaters. Refrigerators have now been added to the company's product range and four new models, from 4 to 10 cu ft, are being marketed. The smallest table top model is 36in high and the price, including purchase tax, is £59 15s. The largest, 10 cu ft, refrigerator costs £125, including tax.

As in previous years, Electrolux have a wide range of absorption type refrigerators on view, including their latest L.50, which has been designed particularly for the larger home and provides 10 sq ft of shelf area. Kelvinator, Ltd., exhibit their complete 1960 range, in the new "Sheerline" styling, comprising cabinets from 4·6 to 18 cu ft. A new model shown by Lec Refrigeration, Ltd., is the "Colonial P.40," a 4 cu ft refrigerator fitted with a newly developed compressor to be known as "Lecomite." The Lightfoot Refrigeration Co. show a range of cabinets made in Western Germany. These include domestic types in five sizes, including a table top model.

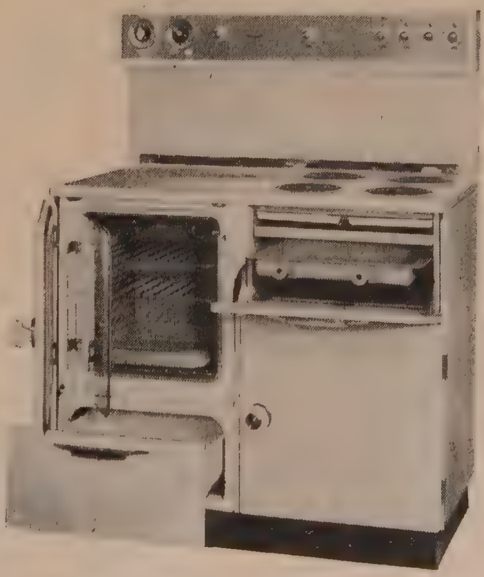
A.E.I.-Hotpoint have on display their "Iced Diamond" models, designed to fit any kitchen whatever its shape or size, while the Frigidaire range will attract those interested in colour in the kitchen. The majority of these models are available in pink, red, cream, green or white, many with matching tops. The latest Frigidaire 4 cu ft refrigerator (model DA-46T) now has an extra-cold super-freezer, a feature previously included only in the larger de-luxe cabinets.

Kenwood have entered the refrigeration market and introduce a range to be sold under the brand name of "Kenwood Norge." These refrigerators, at present imported from America, will be manufactured in this country later this year. They comprise 4, 5·6, 12, 13 and 15 cu ft models—the larger incorporating separate large deep freeze compartments. The smallest refrigerator will sell at 62 gns and the largest at 285 gns, both prices inclusive of purchase tax.

Prestcold is another refrigerator manufacturer exhibiting, while a newcomer is the Gramophone Co., which displays a range of new H.M.V. appliances, including three domestic refrigerators. The smallest, DR.39, is a table top model priced at 60 gns, including tax. Of Continental styling,

Bendix table top refrigerator shown alongside one of the company's automatic washing machines

English Electric "Slimline Senior" 7·7 cu ft refrigerator



Belling "Classic 70" electric cooker

it is finished in white with heat-resisting working top and has a full-length door store. An automatic interior light is also fitted. The larger, 4·8 cu ft model, also a table top refrigerator, is priced at 68 gns and the 5 cu ft model costs 75 gns, both prices including tax. Other new H.M.V. appliances include a food mixer and a spin dryer.

More refrigerators from overseas are shown by a number of exhibitors in the "International" section. These include Indes Refrigerators, Ltd., whose display also incorporates washing machines; Bosch, Ltd., another company to additionally show washing machines, spin dryers, food mixers, etc.; and Bauknecht (Great Britain), Ltd., who show the "Beekay" range of refrigerators, as well as a circulating pump for heating systems.

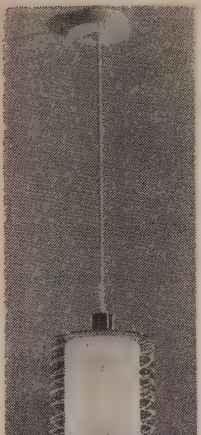
Apart from exhibiting refrigerators, Kenwood also stage demonstrations of their food mixers. Of special interest is their re-styled "Chef" food preparation machine which makes its début. Like its predecessor, there are many attachments available for almost every food preparing job and the price of the basic unit, including purchase tax, is 26 gns. Also re-styled is the company's "Wastemaster" waste disposal unit, while other items of interest include an electric knife and scissors sharpener and a fully automatic dish washing machine.

Another company to demonstrate dish washing machines is Dishlex (Great Britain), Ltd., who are exhibiting their "Automaid" machine.

The Sunbeam Electric Co., Ltd., especially feature their "Mixmaster" food mixer and a frypan cooker fitted with a new deep lid. The company's recently introduced dry shavers—the multi-volt "Shavemaster" and "Rollmaster"—are displayed, as well as the new "Ironmaster Star" electric iron. This iron, weighing $3\frac{3}{4}$ lb, is identical in design to the ultra-lightweight iron already in the company's range but has an extra high loading; it is claimed to take less than a minute to reach maximum heat.

Dimplex Electric, as in previous years, have on view a wide range of heating appliances, including infra-red heaters, oil-filled electric towel rails, panel and column type radiators and, for quick background heating, skirting board styled convectors. On the opening day of the Exhibition the company made a presentation of their millionth and millionth-and-first appliances to a couple who celebrated their golden wedding anniversary, and two "newly-weds."

Ekco heating equipment on show includes both metal and plastic cased convectors in 1 to 3 kW loadings in a choice of colours which blend with most decoration schemes. The company also exhibit their range of radiant fires, including coal-effect models, as well as electric blankets, etc.



G.E.C. type F.30109 pendant unit, as displayed in the company's light and colour exhibit

Wolf "Safetymaster" double-insulated power unit

Sunbeam "Ironmaster Star" electric iron

The complete range of Philips domestic appliances is displayed on a stand divided into three sections. In one section the company's latest food mixer and "Whiskette" are demonstrated, while another is devoted to a demonstration of the Philips spin dryer. Linking these two is a showroom feature where a full range of appliances can be seen, including a fan heater, electric blankets, health lamps, dry shavers, etc.

A re-styled "Rotovair" fan heater and a 1 kW version of the "Memvek" convector heater are the latest products shown by the Midland Electric Manufacturing Co., Ltd. Several other types of fires can be seen, as well as the "Flamenco" 2 kW wrought iron radiant firescreen.

Home laundry appliances always attract a fair amount of attention and several well-known manufacturers exhibit their products. Wilkins & Mitchell, Ltd., are showing the latest "Supertwin" combined washer and spin dryer. Burco give pride of place to the recently introduced "Twenty-One" twin tub washing machine and also show their "Tumblair" drying machine, electric washing machines and wash boilers.

The Hoover Mk. II and III washing machines have been reduced in price by an average of £6 15s each. These can be seen demonstrated, as well as the "Hoovermatic" combined washing machine and spin dryer. In another section, Hoover demonstrate their wide range of floor cleaners, including the latest de-luxe cleaner, model 652, priced at just over £30, and the re-styled "Constellation" spherical cleaner, now reduced in price to £18, both prices inclusive of tax.

Acme Domestic Equipment, Ltd., introduce a pump model spin dryer and the "Twin-Speed" combination washing machine. A re-styled "Adamatic" combined washer and spin dryer has a new two-way continuous surging rinse action. This machine, demonstrated by Ada (Halifax), Ltd., has push-button control and automatic, time-cycle washing operation and is fitted with a built-in 3 kW heater. Several of the company's other washing machines are on view, as well as a new 4·5 cu ft refrigerator styled the "Slendaline."

A.E.G. Welmec Corporation, Ltd., show the latest Mk. II "Lavalux" combined washing machine and spin dryer, which now has a 2 kW heater and is fitted with a device to prevent the machine from boiling dry. There is also a spin dryer, model S.25, and a two-in-one refrigeration unit known as a "Frigomat." This has a normal 6 cu ft refrigerator compartment and a 1 cu ft deep freeze section.

For the home handyman, Wolf Electric Tools, Ltd., demonstrate their latest "Safetymaster" double-insulated power tool, the construction of which eliminates the necessity of an earth wire. On S. N. Bridges' stand a range of equipment developed for their $\frac{1}{4}$in and $\frac{5}{16}$in "Neonic" drills is demonstrated. New attachments include a speed reducer and screw driver, a paint sprayer and an insecticide sprayer.

In another section of the Exhibition dealing with home decoration, the Walpamur Co., Ltd., and the G.E.C. have joined forces to bring together the best in colour and lighting for the home. The stand takes the form of open stage sets displaying suggestions in the use of lighting and colour —all ideas being strictly practical and easily realised. The opportunity has also been taken to show some of the latest G.E.C. lighting fittings, included among which is the "Slendora" decorative lighting unit, combining a fluorescent tube with a tungsten lamp, which should have many applications.

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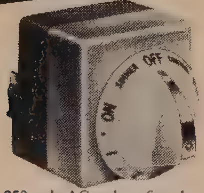

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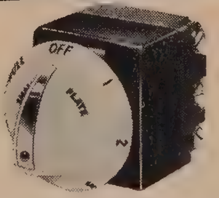

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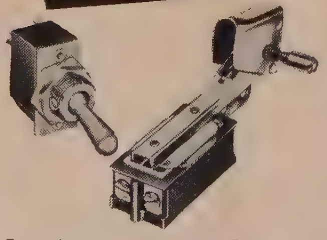

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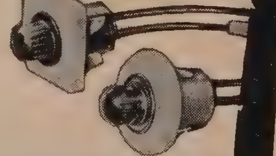

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NEW ELECTRICAL EQUIPMENT

Explosive Gas Detector

A detector that is sensitive to all inflammable gases and requires no adjustment for coal gas, bottled gas or petroleum vapour has been announced by IEC-SIEGER, LTD., 39, Parliament Street, Westminster, London, S.W.1. The equipment consists of a detector head situated in the danger zone connected to a control box incorporating a dual warning system to give an audible and visual alarm. In the detector, catalysts are impregnated in an insulating material which is heated by wire coils forming part of a balanced circuit. Similar materials and coils form, with the detector head, the other arm of the circuit. These catalysts react to inflammable gas by increasing the temperature and electrical resistance of the coils, thereby unbalancing the bridge. Ambient temperature changes affect both wires equally and the circuit remains balanced. The detector elements are protected by gauze against flashback. Electrical unbalance is amplified by a transistor in a feedback circuit which operates a relay and the dual alarm system.

A green indicator lamp which illuminates when the unit is energised is connected in series with the detector circuits and will not light up if these are broken. The electrical contacts are housed in a spray- and corrosion-proof control box, the dimensions of which are $7\frac{7}{8}$ by $5\frac{3}{16}$ by $2\frac{1}{2}$in, the detector being of 3in diameter and $2\frac{1}{4}$in high. Units are available to operate from 6, 12 or 24 V d.c. supplies, and the price of the standard model, including detector head and 15ft cable, is £18 10s.

IEC-Sieger explosive gas detector

Variable Power Supply

A compact unstabilised laboratory power supply, providing a continuously variable d.c. output from 0 to 250 V at up to 50 mA, and a fixed a.c. output of 6·3 V at 1·5 A for heater supply, has been introduced by CLAUDE LYONS, LTD., Valley Works, Ware Road, Hoddesdon, Herts. Applications include h.t. and bias supply for experimental electronic circuits, bridge energising, and polarising supply for measurement of electrolytic capacitors. A switched meter has three voltage ranges, 0-10, 0-50 and 0-300 V, permitting the output voltage to be set and read accurately at all levels, and also a current range of 0-50 mA. For general laboratory use the output may be taken from four insulated jack-top terminals, and for more permanent connection a multi-point socket may be used.

The output voltage can be accurately adjusted with an external voltmeter throughout the range, and the output current can also be adjusted to any value between 0 and 50 mA, even into a short circuit. The unit can therefore be used as a variable current supply. Suitable for an a.c. input of 230-240 V, 50-60 c/s, it has overall dimensions of $9\frac{7}{8}$in wide by 6in deep by $5\frac{5}{8}$in high and weighs $9\frac{1}{2}$ lb. The price is £33 15s.

Hermetically Sealed Plugs

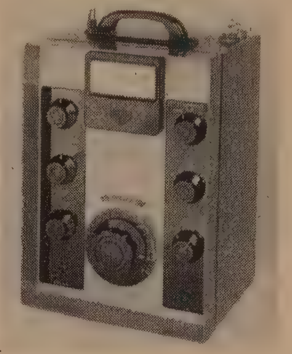
A range of hermetically sealed plugs for miniature rectangular connectors has been introduced by the Electrical Connector Division of ELECTRO METHODS, LTD., Hitchin Street, Biggleswade, Beds. The plugs have a base plate with a flange for soldering into a rectangular opening in a metal container or bulkhead.

Each contact is separately fused into the centre of a low-expansion glass insulator, providing a hermetic seal for the plug and for each contact when used in a pressure- or vacuum-tight housing. The contacts are machined and all metal plug parts are gold plated over silver to provide protection against corrosion, lower contact resistance and to facilitate soldering.

Plugs are available with from 7 to 50 contacts, each with a current carrying capacity of 5 A and suitable for 20 s.w.g. wire. The minimum air space between contacts is $\frac{1}{16}$in and there is a minimum creepage path between contacts of $\frac{5}{64}$in.

Portable Beta Thickness Gauge

A small portable mains operated unit has recently been introduced into the range of nucleonic thickness gauges manufactured by BALDWIN INDUSTRIAL CONTROLS, Dartford, Kent. The gauge, which is calibrated in arbitrary units proportional to weight per unit area, embodies only one radioactive source and detector. The output from the detector is compared with a calibrated reference potential and the difference in signal is amplified by a stable low gain d.c. amplifier.



Baldwin thickness gauge

The output signal is sufficiently powerful to operate both the built-in moving coil meter and, if required, an additional external milliamp recorder. Various measuring head mountings are available according to the application to trade requirements, and alternative radioactive sources are offered depending on the range and thickness or weight per unit area of material to be measured.

Heated Carpet

An electrically heated carpet has been produced by THOMAS BOND WORTH & SONS, LTD., Stourport-on-Severn, Worcs. The carpet is a plain, high quality Wilton, and the heating elements are woven into the carpet and hidden beneath the pile. These elements, manufactured by Mersey Cable Works, Ltd., are woven along the warp at two-inch intervals during manufacture and, in effect, the carpet combines its usual function with that of a 1,000 W heater. The operating voltage is 25 V and each carpet is provided with a transformer.

The carpets are said to be particularly suitable for use in offices and public rooms and it is claimed that heavy furniture will not damage the heating system. They are in the standard 12 by 9ft size, in three contemporary colours, almond green, cherry red and sandalwood (mushroom). Complete with transformer, and ready for connection to a power point, the price is between £85 and £90. Where a fitted carpet is required, Bond Worth can supply an exactly matching body unheated carpet for use as a surround.

Engineering in Europe

ABSTRACTS FROM FOREIGN TECHNICAL JOURNALS

SWITCHING-SURGE protection becomes more important with the raising of the transmission voltage and the relative reduction of the insulation level to about 2·5 times phase voltage. As a result of research into this problem, recommendations are made for the design of special types of divertors in which the recovery of the dielectric strength of the gap to 2 to 2·2 times phase voltage is achieved within 0·003-0·005 sec (by air blast) and the current rating of the divertor is increased to 1,500 A. Furthermore, the divertor must be designed for two successive breakdowns, the second under a current load of 500 A. The use of circuit-breakers with resistance shunts, and the improved type of surge divertor will protect 400-500 kV transmission systems against switching surges incorporating a forced voltage component of 1·5 to 1·6 times phase voltage. The results found were verified by digital computer calculations and by tests on the transmission line of the Votkinsk hydro-electric station to Sverdlovsk.—" The Requirements for Divertors for Switching-Surge Protection," M. L. Levinshtein and K. P. Kadomskaya, *Elektrichestvo*, No. 8, pp. 9-14, 1959, in Russian.

Transformer Surge Stresses

Frequent cases of damage to h.v. distribution transformers protected by Torok tubes and spark gaps indicate that the inter-turn insulation of the input coils of the primary winding must have been stressed by chopped surge waves. Tests on the voltage distribution in the windings of these transformers showed that particularly dangerous stresses result where input coils have stepped insulation, the main danger arising at the end of the coil. If the spark gap is placed at an unfavourable distance in front of the transformer, the reflections of the surge wave will increase the stresses at the transformer terminals and the insulation of the input coil. Likewise, surges of oscillatory character due to the location of the surge divertor on a conductor in front of the transformer, may become as dangerous as chopped waves (spark gap at transformer).

Especially high stressing of the input coil takes place if the spark gap is at distances up to 400 m and the chopped wave shorter than 2 μsec. The amplitudes of the surges penetrating into the input and first coils may be considerably reduced by a capacitor shunted across the transformer. The results of surge tests on various types of transformer with spark gaps in front of them are reported and analysed and a new method of locating defects in the input coils with continuous insulation caused by surge and oscillatory wave tests is suggested. — " Surge Stressing of H.V. Distribution Transformers by Chopped Surge Waves," J. Jirku and D. Domansky, *Elektrotech. Obzor*, Vol. 48, No. 9, pp. 472-477, September, 1959, in Czech.

Transfer Instruments

The investigation is concerned with the calibration of instruments used as a.c. ammeters or voltmeters with an almost identical response in d.c. measurements and a.c. measurements up to acoustic frequencies. These instruments, known as transfer instruments, can reach precisions of the order of 10^{-4} if they are calibrated on d.c. with e.m.f. and resistance standards. The first part of the paper defines the concepts of the standard and the transfer error, and electrodynamic, electrostatic and photo-electric instrument systems are compared particularly with reference to the accuracies attainable. In the second part, thermal transfer instruments proper, particularly those with thermocouples and thermistors with indirect heating, are considered; their physical and design characteristics are discussed and various phenomena, depending more or less on the frequencies of the measured quantities, are analysed. These are responsible for deviations from the calibration curve by which the transfer error may become non-negligible; the absolute and percentage values of the errors of various designs are discussed.

The instruments, commercially available from leading international firms, are then considered and their precision limits as well as frequency ranges are given. An analytical study of the thermal circuits of thermocouple and thermistor instruments follows; this considers all the parameters having a possible effect on the transfer errors of these instruments.—" Thermal A.C.-D.C. Transfer Instruments," M. Careggio, *Elettrotecnica*, Vol. 46, No. 10, pp. 678-705, October, 1959, in Italian.

Series-Connected Rectifiers

A comprehensive survey and investigation of all the problems of technical and economic usefulness of the series-connection of l.v. rectifier units reveals that where the reduction of numbers of backfires is the only purpose of using series connection of the units, this method is certainly not justifiable economically. However, if high outputs are to be achieved with a simultaneous reduction of the number of backfires, which then introduce the danger of costly power losses, and even outages, the method of series connection enables the outputs to be increased several times and is therefore very promising. This is exemplified in the most powerful traction rectifier station erected so far (9·9 MW at 3·3 kV) built with series-connected units. Its average number of backfires per annum is less than one. The technical and economic characteristics of this installation, including its overall efficiency, are higher than those of any comparable installation.—" Prospects of the Use of Series-Connected L.V. Rectifier Units," L. S. Fleishman, *Elektrichestvo*, No. 9, pp. 61-65, 1959, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review.*

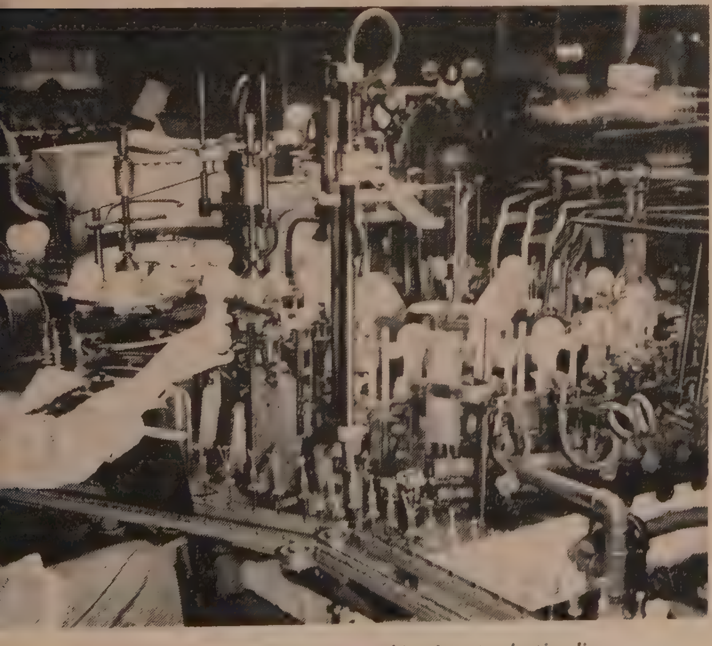
Filament Lamp Production

THE STROOD (KENT) WORKS OF LUXRAM ELECTRIC, LTD.

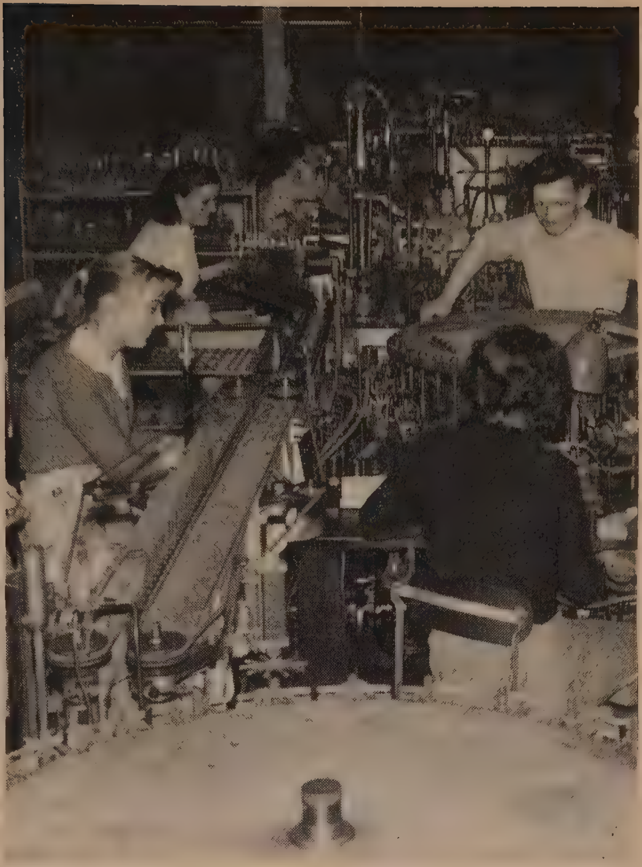
IN 1947, Luxram Electric, Ltd., moved from Edmonton, where they had been since 1925, to the new factory at Strood, near Rochester. This factory produces 12 million g.l.s. lamps per annum and this will be increased to 15 million when the new extension has been completed. Four million miniature lamps, three million special lamps and three million automobile lamps per annum are also produced at Strood. Of the total production, 70 per cent is sent for export. At present, the factory has an area of 120,000 sq ft, and the new extension, which is under construction, will add a further 20,000 sq ft. In November last year, the company was awarded a British Standards Institution licence in connection with the manufacture of lamps to B.S. 161.

The company produces g.l.s. lamps in voltage ranges from 100 to 130 V and 200 to 260 V up to 200 W and also tungsten filament lamps up to 1,500 W. Single-coil "long-life" 2,000 hr lamps are also produced. Up to 200 W, 50 per cent of the g.l.s. lamps are manufactured with fuses. Above 200 W, all lamps contain fuses. Luxram have also recently commenced manufacture of high-pressure mercury vapour lamps.

Lamp making machinery is also made by the company for their own use and for sale. At present, the firm operates 12 groups of lamp making machinery. G.l.s. lamps are produced on six groups, automobile lamps on three groups and miniature lamps on two groups. These production units are arranged in a layout similar to those described in an article entitled "Lamp Making Machinery" in the *Electrical Review* of 22nd August, 1958. Although most of the factory, which employs 300 women and 100 men, is worked on a single-shift basis, the two high-speed g.l.s. groups are being operated at night.



Sealing and exhaust machine in a production line



Stem making and filament mounting at the Luxram works

MINERAL-INSULATED CABLES

MINERAL-INSULATED cables were standardised dimensionally in the 1949 edition of B.S. 883, "Cables and Flexible Cords for Electrical Equipment of Ships." A new publication, B.S. 3207 : Part 1 : 1960, "Mineral-insulated Cables, Part 1: Copper-sheathed Cables with Conductors," is the first British Standard to give a complete specification for such cables, with tests. The dimensions are the same as those given in B.S. 883 but they are no longer related to drill sizes and are now stated as standard values with positive and negative tolerances.

In the new standard the cables formerly known as 250 V cables are re-classified for 440 V but the 660 V classification remains unchanged. Both classes are suitable for use at the stated voltage between conductors or between conductors and sheath. The cables covered by the first part of the new standard have copper conductors and copper sheath, with provision for an outer p.v.c. covering when required. It is hoped to publish additional parts dealing with other conductor materials and different types of sheath.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

27151. Cosmocord, Ltd.—Transducing systems. 20th December, 1955. (Cognate application 27152, 20th September, 1954.) (829181.)

1955

6590. Pifco, Ltd. (Cheong Shing Flashlight Factory, Ltd.).—Electric torches. 7th March, 1956. (829543.)

8860. Henley's Telegraph Works Co., Ltd., W. T., and Griffiths, F. T.—Point and die assemblies for extrusion, e.g., of plastic or metal sheathing for electrical conductors. 26th March, 1956. (829185.)

9365. Electric & Musical Industries, Ltd. —High frequency transmission lines. 27th March, 1956. (829186.)

9809. British Thomson-Houston Co., Ltd.—Luminescent material. 28th March, 1956. (829546.)

10578. Electric & Musical Industries, Ltd.—Electron discharge devices. 13th April, 1956. (829547.)

11436. Ismay Lamps, Ltd.—Method and apparatus for separating coiled wire filaments for electric incandescent lamps or other thermionic devices. 12th April, 1956. (829492.)

15604. General Electric Co., Ltd.—Sodium vapour electric discharge lamps. 17th May, 1956. (Addition to 801482.) (829286.)

20744. English Electric Co., Ltd.—Electric control apparatus. 16th July, 1956. (829549.) 23955. Electrical protective relays. 17th August, 1956. (829641.)

26765. Telegraph Construction & Maintenance Co., Ltd.—Electric cables. 14th September, 1956. (829189.)

30468. Eastside Electricals, Ltd., and Evans, E. J.—Galvanometers or the like. 25th January, 1957. (829289.)

30746. English Electric Co., Ltd.—Control apparatus for textile-ring spinning and like frame drives. 22nd October, 1956. (829551.)

1956

2797. Sylvania Electric Products, Inc.—Electroluminescent light amplifier. 27th January, 1956. (829294.)

3339. Metropolitan-Vickers Electrical Co., Ltd.—Electric coupling devices. 22nd January, 1957. (829295.)

4864. Igranic Electric Co., Ltd. (Cutler-Hammer, Inc.).—Dynamic braking systems for electric motors. 16th May, 1957. (829629.)

5928. Bird Electronic Corporation.—Standing wave indicator. 24th February, 1956. (829485.)

6617. Philips Electrical Industries, Ltd. —Cathode-ray tubes. 2nd March, 1956. (829297.)

7075. Egyesult Izzolampa es Villamossagi R.T.—Vacuum tube amplifiers. 6th March, 1956. (829487.) 7076. Electrode assemblies for electric discharge devices. 6th March, 1956. (829488.)

8539. Standard Coil Products Co., Inc.— —Neutralising circuits. 19th March, 1956. (829403.)

9325. Telefunken G.m.b.H.—Transistor oscillator circuits. 26th March, 1956. (829301.)

11390. Radio Corporation of America.—Demodulator circuit. 13th April, 1956. (829304.)

12548. Busch-Jaeger Dürener Metallwerke A.G.—Electric terminal assemblies. 24th April, 1956. (829683.)

12584. Fansteel Metallurgical Corporation.—Electrolytic capacitors. 24th April, 1956. (829408.)

13945. Radio Corporation of America.—Ferroelectric systems. 4th May, 1956. (829566.)

15725. Meek, G. S.—Electrically operable soldering irons. 22nd May, 1957. (Cognate application 34309, 9th November, 1956.) (829567.)

18134. B. & H. Instrument Co., Inc.—Frequency measuring system. 12th June, 1956. (829568.)

23713. Midgley, A. H.—Time controlled electric switches. 31st July, 1957. (829417.)

24376. S.T.I.P.E.L. Soc. Telefonica Inter-Regionale Piemontese e Lombarda, per Azioni.—Negative impedance amplifier with separate input and output particularly for telephone systems. 9th August, 1956. (829307.)

25581. Held, S.—Electrically maintained valance wheel. 21st August, 1956. (829191.)

25784. Philips Electrical Industries, Ltd. —Low-pressure mercury-vapour discharge lamps. 23rd August, 1956. (829569.)

26171. Telephone Manufacturing Co., Ltd.—Mounting of the armatures of electromagnetic relays. 20th August, 1957. (829689.)

27585. United States Atomic Energy Commission.—Nuclear reactor control. 10th September, 1956. (829427.)

27911. Thorn Electrical Industries, Ltd. —Coating apparatus. 2nd September, 1957. (Cognate application 27912, 12th September, 1956.) (829573.)

28884. Allmänna Svenska Elektriska A.B. —Arrangement for the individual temperature control of a plurality of single-phase electric heating means. 21st September, 1956. (829310.)

29871. Sperry Rand Corporation.—Electronic switch. 1st October, 1956. (829200.)

30986. M.T.E. Control Gear, Ltd., and Olley, N. H.—Electrical terminal blocks. 13th November, 1957. (829202.)

31423. Standard Telephones & Cables, Ltd.—Methods of producing silicon of high purity. 11th October, 1957. (829421.) 31424. Method and apparatus for producing semiconductor materials of high purity. 13th September, 1957. (829422.)

31751. Leece-Neville Co.—Regulating system for a dynamo-electric machine. 18th October, 1956. (829420.)

31923. General Electric Co.—Electron discharge devices. 19th October, 1956. (829423.)

34815. British Thomson-Houston Co., Ltd.—Fuse arrangement particularly for high voltage transformers. 25th October, 1957. (829312.)

36486. Champion, C. L.—Closed loop control systems. 21st November, 1957. (829314.)

37037. Philips Electrical Industries, Ltd. —Cathode-ray oscilloscopes. 4th December, 1956. (828550.)

37482. Standard Telephones & Cables, Ltd.—High-compression beam generating system for velocity modulated tubes. 7th December, 1956. (828224.)

37508. British Telecommunications Research, Ltd.—Power feed arrangements for telecommunication or like systems. 21st November, 1957. (Addition to 744340.) (828454.)

38621. United Kingdom Atomic Energy Authority.—Nuclear reactors. 13th December, 1957. (829436.)

39035. General Electric Co., Ltd.—Ferro-electric data storage devices. 21st March, 1958. (829210.)

39721. General Electric Co., Ltd.—Metal vapour electric arc convertors. 20th December, 1957. (829647.)

39724. Komusin, E.—Automatic telephone systems. 31st December, 1956. (829212.)

1957

464. Standard Telephones & Cables, Ltd. —V.h.f. superheterodyne circuit arrangement. 4th January, 1957. (829437.)

1292. C.A.V., Ltd.—Light regulating means for electric lamps. 10th January, 1958. (829650.)

2122. Mullard, Ltd.—Circuit arrangements comprising cathode-ray storage tubes. 21st January, 1957. (829654.)

2454. AMP, Inc.—Machines and methods for making electrical leads. 23rd January, 1957. (829501.)

4659. Brentford Transformers, Ltd.—Electrical regulating apparatus. 31st December, 1957. (829217.)

8471. General Electric Co., Ltd.—Electric lighting fittings. 13th March, 1958. (829441.)

8826. General Electric Co., Ltd.—Overspeed protective arrangements for electric motors. 11th March, 1958. (829707.)

1958

801. Telefonaktiebolaget L. M. Ericsson. —Device for recording received radar pulses. 8th January, 1958. (829256.)

2348. Collins Radio Company.—Single side band communication system using electromechanical filters. 23rd January, 1958. (829258.)

3532. Siemens & Halske A.G.—Electronic switches and switching systems. 3rd February, 1958. (829261.)

14076. Sperry Rand Corporation.—Method of bonding an element of semiconducting material to an electrode. 2nd May, 1958. (829170.)

18675. International Business Machines Corporation.—Logical circuits using junction transistors. 26th June, 1956. (Divided out of 829083.) (829084.)

20639. Standard Telephones & Cables, Ltd.—Electrolytic capacitors. 27th June, 1958. (829073.)

37416. Bendix Aviation Corporation.—Electrical connectors. 26th March, 1957. (Divided out of 828789.) (828790.)

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 17th March:

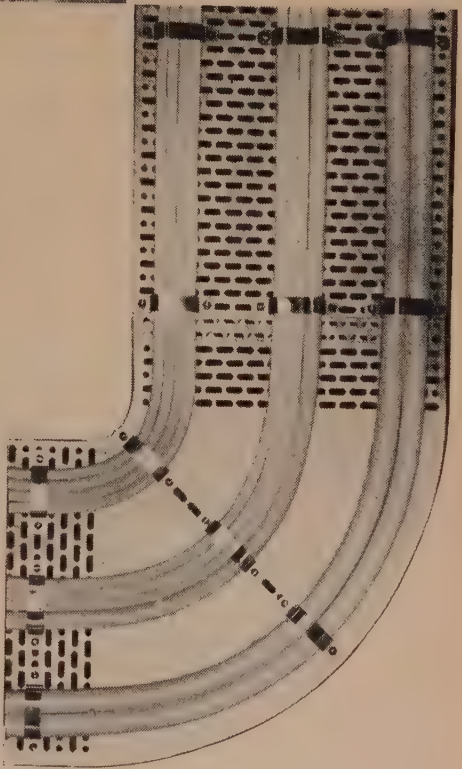
Sun. No. 782,086. Class 9. Electric, electronic and mechanical checking (supervision) instruments and apparatus for use in the manufacture, and testing the operation of, motor vehicles and of internal combustion engines, and parts.—Sun Electric Corporation, Chicago, Ill., U.S.A. Address for service, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

Bi-Stat. No. 795,933. Class 9. Electrical apparatus and instruments for use in controlling the operation of mechanical contrivances by electric current, voltage, frequency or phase, and parts.—Brookhirst Igranic, Ltd., Elstow Road, Bedford.

Allpas. No. 793,846. Class 11. Electric light fittings.—Loblite, Ltd., Third Avenue, Team Valley, Gateshead-on-Tyne.

Infinilite. No. 797,142. Class 11. Electric light fittings.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

BICC (design). No. 786,641. Class 17. Electric insulating materials and articles made therefrom.—British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.



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1 ,, 1" Carbon Steel Holsaw
1 ,, $1\frac{1}{2}$" Carbon Steel Holsaw
3 ,, $\frac{3}{4}$" Carbon Steel Holsaw Blades
3 ,, 1" Carbon Steel Holsaw Blades
3 ,, $1\frac{1}{2}$" Carbon Steel Holsaw Blades
2 ,, $\frac{1}{4}$" Pilot Drills
1 ,, CT8 Carbide Drill
1 ,, CT10 ,, ,,
1 ,, CT12 ,, ,,
1 ,, CT14 ,, ,,
1 ,, A14 $\frac{1}{4}$" Wood Auger
1 ,, A38 $\frac{3}{8}$" Wood Auger
1 ,, A12 $\frac{1}{2}$" Wood Auger
1 ,, A58 $\frac{5}{8}$" Wood Auger
1 ,, A34 $\frac{3}{4}$" Wood Auger
1 ,, Set of 4 High Speed Twist Drills ($\frac{1}{16}$", $\frac{1}{8}$", $\frac{3}{16}$", $\frac{1}{4}$")
1 ,, M90/SA Extension Lead with Connector

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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 14th MARCH

Birmingham.—College of Technology, Gosta Green, 6 p.m. I.E.E. South Midlands Supply and Utilisation Group. "Turbo-Generator Performance under Exceptional Operating Conditions," by F. H. Birch.

Cheltenham.—Technical College, 6 p.m. I.E.E. Western Centre. "Silicone Electrical Insulation," by J. H. Davis.

Liverpool.—Exchange Hotel, Tithebarn Street, 6.45 for 7.15 p.m. E.C.A. Liverpool Branch. Annual dinner.

Exchange Hotel, 7.15 p.m. Institution of Plant Engineers, Merseyside and North Wales Branch. Annual general meeting, followed by a film "Tubular Engineering."

London.—Savoy Place, W.C.2, 6 p.m. I.E.E. Informal Meeting. Discussion on "Should Engineers be Encouraged to take up Administrative Positions early in their Careers?" opened by K. E. Green. (Joint meeting with Graduate and Student Section.)

London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, Radar Group. Discussion on "Short Range Navigational Aids."

Newcastle-on-Tyne.—Rutherford College of Technology, Northumberland Road, 6.15 p.m. I.E.E. North Eastern Measurement and Electronics Group. Discussion on "Component Reliability."

Reading.—George Hotel, King Street, 7.15 p.m. I.E.E. Reading District Meeting. "The Protection of High-Voltage Systems from Lightning Faults," by Dr. R. H. Golde.

Salford.—Royal Technical College, 7 p.m. I.E.E. North Western Graduate and Student Section. "Semiconductors," by B. Stutthard.

Sheffield.—Livesey Clegg House, 44, Union Street, 7.30 p.m. Junior Institution of Engineers, Sheffield Section. "Electrostatic Precipitators," by B. J. Duncan.

Grand Hotel, 6.30 p.m. I.E.S. Sheffield Centre. "Television Studio Lighting," by R. W. Koplick.

Grand Hotel, 6.15 p.m. I.Prod.E. East and West Ridings Region. Annual general meeting followed by "Mechanical Handling in the Heavy Steel Industry—Covering Steelmaking, Rolling and Forging Processes to the Completion of the Product," by Dr. H. R. Mills.

TUESDAY, 15th MARCH

Birmingham.—College of Technology, Gosta Green, 6 p.m. I.E.E. South Midland Education Discussion Circle. Discussion on "The Teaching of Magnetic Amplifier Theory," opened by K. C. Parton.

Cambridge.—Cavendish Laboratory, Free School Lane. I.E.E. Cambridge Electronics and Measurement Group. "The Decca System of Navigation," by C. Powell.

Dumfries.—I.E.E. South West Scotland Sub-Centre. "Future Generation and Transmission Development in Scotland," by J. Henderson.

Edinburgh.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South East Scotland Sub-Centre. "Lighting," by Dr. F. A. Benson.

Exeter.—S.W.E.B., Bedford Street, 3 p.m. I.E.E. South Western Sub-Centre. "The Application of Low Pressure Resins to Some High Voltage Switchgear Designs," by T. R. Manley, K. Rothwell and W. Gray. Imperial Hotel, 7.30 p.m. Annual dinner.

Huddersfield.—Y.E.B., Market Street, 6.30 p.m. I.E.E. North Midland Utilisation Group. "The Provision of Adequate Electrical Installations in Buildings—Small Industrial Premises," by J. A. Sharp.

Liverpool.—Merseyside and North Wales Electricity Board Industrial Development Centre, 6 p.m. I.E.S. Liverpool Centre. "An Architect's Impression of the Brussels Exhibition," by J. G. R. Sheridan.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. "Fast Response Transistor Chopper-Type Amplifier with Low Carrier Frequency," by I. C. Hutcheon and D. Summers.

Manson House, Portland Place, W.1, 6.30 p.m. Association of Supervising Electrical Engineers, London National Lecture. Discussion on "The Role of the Engineer and of the Architect in the Planning of Electrical Installations."

Manchester.—Engineers' Club, 6.15 p.m. I.E.E. North Western Utilisation Group. "Discrimination between H.R.C. Fuses," by E. Jacks.

Newcastle-upon-Tyne.—Roadway House, Oxford Street, 7.30 p.m. A.S.E.E. Newcastle-upon-Tyne and District Branch. Films.

King's College, 6.15 p.m. Institute of Physics, North Eastern Group. "Applications of Thermo-Electricity," by Prof. D. A. Wright.

Preston.—N.W.E.B., 19, Friargate, 7 p.m. I.E.S. North Lancashire Group. Annual general meeting followed by a talk.

South Farnborough.—Queens Hotel, 7.30 p.m. A.S.E.E. Aldershot and District Branch. "Manufacture and Uses of Mineral Insulated Cable," by G. E. D. Redman.

WEDNESDAY, 16th MARCH

Barnsley.—Arcadian Restaurant, Market Street, 7 p.m. I.E.E. North Midland Centre and Sheffield Sub-Centre. "The Reliability and Life of Impregnated-Paper Capacitors," by J. P. Pitts.

Belfast.—Queen's University, 7.30 p.m. I.E.E. Northern Ireland Centre. Faraday Lecture. "Electrical Machines," by Prof. M. G. Say.

Brighton.—Technical College, 6.30 p.m. I.E.E. Southern Centre. Lecture on "Television Recording: A Survey of the Problems and the Methods Currently in Use," by J. Redmond.

Cardiff.—Welsh College of Advanced Technology, 6.30 p.m. British Institution of Radio Engineers, South Wales Section. "Recent Developments in Printed and Potted Circuits," by H. G. Manfield.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "An Electrostatic Dust Monitor," by Dr. D. H. Grindell.

I.E.E. London Graduate and Student Section, 3 p.m. Visit to Euston Station Signal Box.

Manson House, Portland Place, W.1, 7 p.m. Society of Instrument Technology. "The Simulation of a Large Chemical Plant on an Electronic Analogue Computer," by A. H. Doveton and K. C. W. Pedder.

A.S.E.E. South West London Branch, 2.30 p.m. Visit to B.B.C. Television Studios.

Manchester.—Engineers' Club, 6.15 p.m. I.E.E. North Western Electronics and Communications Group. "Data Processing," by J. C. Gladman.

Nottingham.—East Midlands Electricity Board Showroom Theatre, Carrington Street, 7.30 p.m. A.S.E.E. Nottingham Branch. "Modern Crane Control Gear," by W. G. Stoner.

Rochester.—King's Head Hotel, High Street, 7 p.m. Institution of Plant Engineers, Kent Branch. "Power from Nuclear Energy," by Dr. M. D. Wood.

Rugby.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. "A.C. Commutator Machines," by D. Bartho.

Swansea. — Central Library, 7 p.m. I.Prod.E. Wales Region. "Heating, Lighting and Ventilation of Modern Factories," by A. J. Dalton.

Wolverhampton.—Chamber of Commerce, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Variable Speed Drives from A.C. Mains," by V. W. Press.

THURSDAY, 17th MARCH

Birmingham. — Engineering Centre, Stephenson Place, 10.15 a.m. Combustion Engineering Association, Midland Region. Discussion on "Research Towards Improving Mechanisation and Automatic Control in Industrial Coal Fired Boiler Houses," opened by G. G. Thurlow.

Blackburn.—Castle Hotel, 7.30 p.m. Institution of Plant Engineers, Blackburn Branch. Annual general meeting.

Chelmsford.—Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Rockets and Satellites," by Dr. G. V. Groves.

Cheltenham.—Belle Vue Hotel, The Strand, 7.30 p.m. I.Prod.E. South Western Region. Annual general meeting followed by two films "The Dounreay Sphere," and "Fawley Achievement."

Edinburgh.—George Hotel, 7 for 7.30 p.m. I.E.E. Scottish Centre. Diamond jubilee dinner.

Harwell.—Reactor School, A.E.R.E., 5.45 p.m. A.S.E.E. Oxford and Districts Branch. "Earthing and Earth Leakage Protection of Electrical Installations," by J. A. Robbins.

London.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. British Electrical and Allied Manufacturers' Association. Annual luncheon. 3 p.m. Annual general meeting.

76, Mark Lane, E.C.3, 2.30 p.m. Diesel Engineers' and Users' Association. "Factors Governing Turbo-Charger Design," by C. L. G. Worn.

32, Welbeck Street, W.1, 8 p.m. British Institute of Radio Technology. "Reduction of Radiation Hazards in the Therapeutic Use of Small Multiple Radioactive Sources."

Peterborough.—White Lion Hotel, Church Street, 7.30 p.m. Institution of Plant Engineers, Peterborough Branch. Annual general meeting.

FRIDAY, 18th MARCH

Birmingham.—Imperial Hotel, Temple Street, 7.30 p.m. Institution of Plant Engineers, Birmingham Branch. Annual general meeting, followed by a film.

Crewe.—Royal Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Modern Trends in Industrial and Commercial Lighting Installations," by V. Heydon.

London.—Institution of Mechanical Engineers, Birdcage Walk, S.W.1, 6.30 p.m. Joint meeting of the Graduate and Student Sections of the I.E.E., I.C.E., and I.Mech.E. Address by Sir George Edwards.

14, Rochester Row, Westminster, 7 p.m. Junior Institution of Engineers. "Application Uses and Limitations of Modern Plastic Materials in Engineering," by J. M. J. Estevez.

Street Lighting Schemes

Blackburn Corporation is recommended to approve a scheme, estimated to cost £6,200, for the conversion of street lighting to electricity.

Bradford Corporation has approved schemes for the conversion of street lighting in the following areas: Buttershaw, Wibsey and Odsal (£7,719) and Chellow Dean (£6,381).

Grimsby R.D.C. is to spend £4,744 during the coming year on street lighting improvements.

Halstead (Essex) U.D.C. has approved proposals, estimated to cost £2,000, for the improvement of street lighting.

Jarrow Town Council is recommended to approve sodium street lighting schemes at Valley View and Primrose Terrace (£3,622) and High Street (£8,461).

Mansfield Corporation has approved a scheme for Group "A" mercury fluorescent lighting in the Market Square.

A detailed scheme is to be prepared for converting all gas street lighting at **Newbury** to electricity. The work is expected to cost about £30,000.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Electricity Commission of New South Wales, Sydney. 11th April. 33 kV outdoor circuit-breakers and current transformers. (E.S.B. 5912/60.)* Shunt capacitor banks. (E.S.B. 5911/60.)* 19th April. Five 132 kV outdoor current transformers. (E.S.B. 5913/60.)* 23rd May. Coal handling plant for Vales Point power station. (E.S.B. 6368/60.)*

Birmingham.—City Transport Committee. 30th March. Supply and installation of a pair of electrically operated steel roller shutter garage doors. W. H. Smith, general manager, City Transport Department, Council House, Congreve Street.

Blackpool.—Corporation. 28th March. Groups "A" and "B" street lighting equipment. (See this issue.) Steel poles and fibreglass bases and collars. (See this issue.)

Burma. — Electricity Supply Board, Rangoon. 20th March. Batteries, fuses, meters and measuring instruments and cables. (E.S.B. 5960/60.)*

Ceylon.—Department of Government Electrical Undertakings. 6th April. Transformers. (E.S.B. 5954/60.)*

Egypt.—Director-General, Mechanical and Electrical Department, Ministry of Public Works. Transformers, switchboards and l.v. cables. (E.S.B. 5714/60.)*

Formosa.—Central Trust of China, Taipei. 30th March. Telephone cable. (E.S.B. 6328/60/I.C.A.)* 12th May. Telephone dial equipment. (E.S.B. 6329/60/I.C.A.)*

France. — Purchasing and Contracting Officer, A.C.E. Communications Electronic Equipment, Signal Division, Material Branch, S.H.A.P.E., Paris. 21st March. H.f. single side-band transportable radio stations. (E.S.B. 6315/60.)*

India.—Andhra Pradesh Electricity Department, Hyderabad. 23rd March. Insulators and accessories. (E.S.B. 3790/60.)* 24th March. Galvanised steel wire and accessories. (E.S.B. 3791/60.)*

Inverkeithing.—Corporation. Trunk road lighting equipment. (See this issue.)

Iraq.—Iraqi Republican Railways, Baghdad. 27th March. Electric lamps. (E.S.B. 4991/60.)*

Kenya.—Dar-es-Salaam Municipal Council. 18th March. Street lighting equipment. (E.S.B. 6373/60.)*

Littlehampton.—U.D.C. 23rd March. Supply and delivery of one submersible pump, complete with starter. Water engineer, Council Offices.

New Zealand.—G.P.O., Wellington. 12th April. High stability power sub-units. (E.S.B. 5910/60.)*

Dunedin Electricity Department. 27th May. Batteries for Andersons Bay and Dunedin substations. (E.S.B. 6398/60.)*

Wellington Electricity Department. 23rd March. P.v.c. covered aerial cable. (E.S.B. 6388/60.)*

Northern Ireland.—Armagh Education Committee. 28th March. Electrical installation in new primary school at Lisdrumchor, Glenanne, Co. Armagh. Hobart & Heron, architects, Scottish Provident Buildings, Belfast.

Ministry of Finance. 21st March. Electrical installation in new office building at King Street, Magherafelt, Co. Londonderry. Tender documents from Room 103, Law Courts Building, Belfast.

Pakistan.—Director of Purchase, Water and Power Development Authority, Dacca. 19th March. Switchgear and accessories. (E.S.B. 6383/60.)*

St. Helens.—Corporation. 28th March. Trunk road lighting equipment. (See this issue.)

Scotland.—Admiralty. 22nd June. Electrical installation in a naval storage depot in the Loch Striven area. (See this issue.)

South Africa.—Stores Department, South African Railways, Johannesburg. 1st April. Stranded steel conductor wire. (E.S.B. 5986/60.)*

South Vietnam. — Central Purchasing Authority, Saigon. 6th April. Telephone apparatus. (E.S.B. 6310/60/I.C.A.)*

Sudan.—Controller of Stores and Workshops, Posts and Telegraphs Department, Khartoum South. 25th April. Underground cables. (E.S.B. 6375/60.)*

Stores Department, Sudan Railways. 23rd March. Fluorescent water-tight and armoured glass fittings. (E.S.B. 5948/60.)*

United States.—District Engineer, U.S. Army Engineer District, Portland, Oregon. 1st April. Two 17,250 h.p. hydraulic turbines for Cougar reservoir. (E.S.B. 6372/60.)*

Uruguay.—Administracion General de los Usinas Electricas y los Telefonos del Estado. 26th April. Lead covered telephone cables. (E.S.B. 4984/60.)*

West Riding.—County Council. 21st March. Trunk road lighting equipment. (See this issue.)

Wigan.—Corporation. 21st March. Street lighting equipment for the year commencing 1st April next. (See this issue.)

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Alnwick.—Girls' grammar school; county architect, County Hall, Newcastle-on-Tyne.

Askern (Yorks.). — Secondary school, Campsmount (£258,456); board of governors.

Aylesbury.—Houses (44), Brill, Oving and Stone, for R.D.C.; Raymond White & Ridley, architects, 4, Temple Square, Aylesbury.

Barrhead.—Houses (156), Auchenback scheme; W. Baillie & Son, architects to Council, 4, West Regent Street, Glasgow.

Birkenhead.—Girls' high school, Woodchurch estate; borough architect, 3, Conway Street.

Bolton.—Works and offices, J. Ainsworth & Co., Ltd., Bee Hive Works.

Bournemouth.—Enlargement of Law Courts (£35,000); borough engineer, Town Hall.

Brecknock.—New Council chamber and extensions to existing buildings, Oxford House, The Watton; Merton Jones & Richards, architects, St. Mary's Chambers, Abergavenny.

Cardiff.—Grammar school for boys at Fairwater; city architect, 12, Park Place.

Chesterfield.—Work on final stage of new College of Technology to begin during summer; borough architect.

Connah's Quay.—Assembly hall; J. G. L. Poulson, architect, 29, Ropergate, Pontefract.

Durham.—Junior school, Peterlee; county architect, South Street, Durham.

Grammar/technical school, Seaham; Newrick & Blackbell, architects, 58, John Street, Sunderland.

Gateshead.—Community centre, Lobley Hill Road (£15,000), and nursery school, Bensham Grove (£11,000); G. F. Winters, borough engineer.

Gillingham (Kent).—Factory; Bowater-Eburite, Ltd., Bowater House, Knightsbridge, London, S.W.7.

Harrogate.—Block of flats, Princes Villa Road; C. W. Cowen, Ltd., 12, Station Parade.

Huyton-with-Roby.—Shopping centre in connection with Town Centre Development; D. Willgoose, clerk, Council Offices, Derby Road.

Kingston-on-Thames. — Showrooms and offices, High Street; Fuller, Hall & Foulsham, architects, 212, High Holborn, W.C.1.

Lindsey.—Infants' school, Heapham Road, Gainsborough, extensions to Barton-on-Humber Grammar School and extensions to Gainsborough Technical College; A. R. Clark, county architect, County Offices, Lincoln.

London.—Out-patients' and casualty department for University College Hospital; Adams, Holden & Pearson, architects, 38, Gordon Square, W.C.1.

Factory extensions; Innoxa (England), Ltd., Balls Pond Road, N.1.

Office block, York Buildings, Strand; Commercial & Suburban Properties, Ltd., 45, New Bond Street, W.1.

Lowestoft.—Modern school, Lound Hall site, Lothingland; county architect, County Hall, Ipswich.

Mablethorpe.—Private estate of 230 holiday bungalows (50 to be built during 1960); W. G. C. Hammond, Ltd., Mablethorpe, Lincs.

Macclesfield.—Factory, Hurdsfield; W. Hargreaves & Co., Ltd., Old Road, Cheadle, Cheshire.

Mallaig.—Cold store; A. Fairley, secretary to the Herring Industry Board, 1, Glenfinlas Street, Edinburgh, 3.

Morley.—Houses, Moorhead estate, in two contracts of 48 and 30; borough surveyor, Town Hall.

Neston.—Houses (50), Clayhill estate, Liverpool Road; S. C. Foulkes, architect to Council, Merton Place, Colwyn Bay.

Newcastle-on-Tyne.—Blocks of 630 flats, Scotswood Road and Pottery Bank; Wimpey & Co., contractors, Fenwick Terrace.

Norwich.—Administration block and recreation hall at Little Plumstead Hospital, with further works at a later date (£102,000); Architects' Department, 33, Parkside, Cambridge.

Rutland.—Hall/gymnasium, library, art room, workshop block and classrooms, Uppingham Secondary Modern School; planning officer, County Offices, Catmose, Oakham.

St. Helens.—Flats (96), Fleet Lane; borough architect.

South Shields.—Workshops for Middle Docks & Engineering Co., Ltd.; J. G. Thompson & Sons, Ltd., Fowler Street.

Stamford.—Houses (44), maisonnettes (14) and garages (47), on King's Road estate; borough surveyor.

Stanground.—New clinic for Hunts. C.C.; county architect, Huntingdon.

Six-form entry secondary modern school for Hunts. C.C.; county architect, Huntingdon.

Stilton.—First instalment of 4-class school for Hunts. C.C. (£20,000); county architect, Huntingdon.

Worcester.—Dwellings (65), Moor Street; Coleman & Tyas, Ltd., Victoria Road, Bidford-on-Avon.

---

* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.

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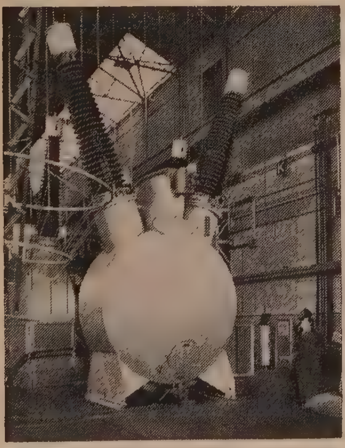

The illustrations show a complete 330 kV. bushing insulator and a 330 kV. circuit breaker, by courtesy of the A.E.I. Co.

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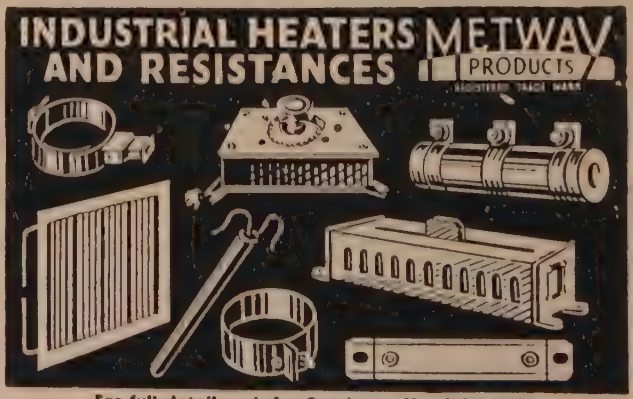

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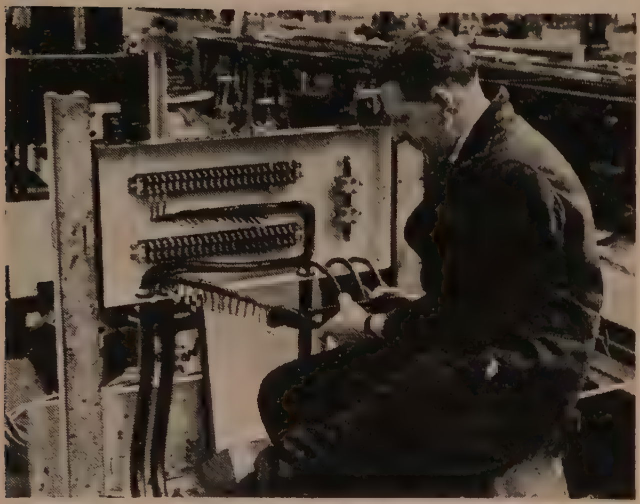

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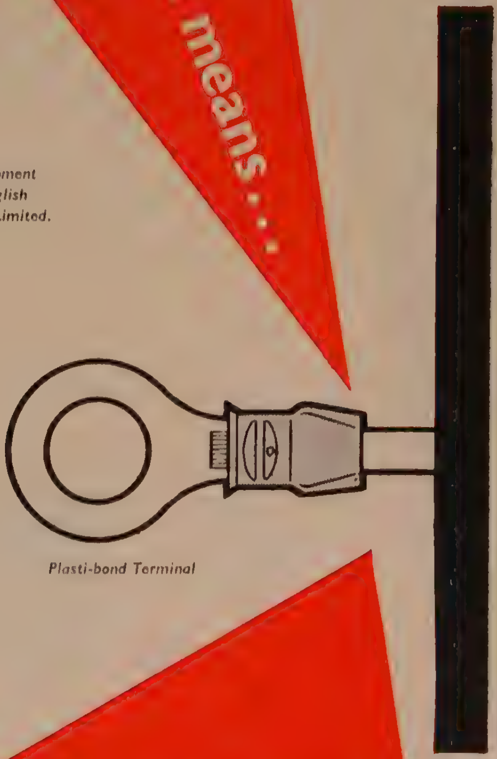
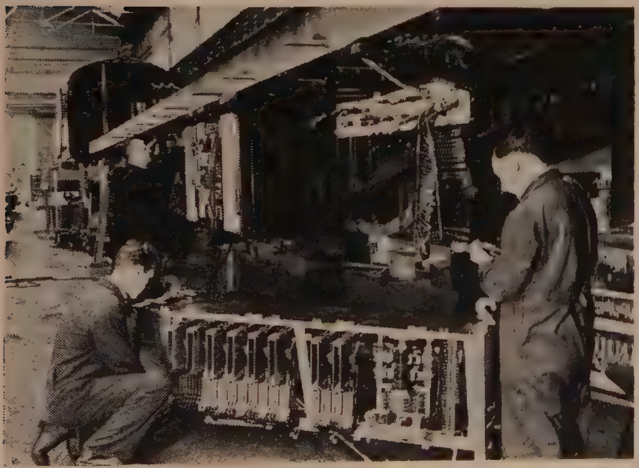


Plasti-bond Terminal



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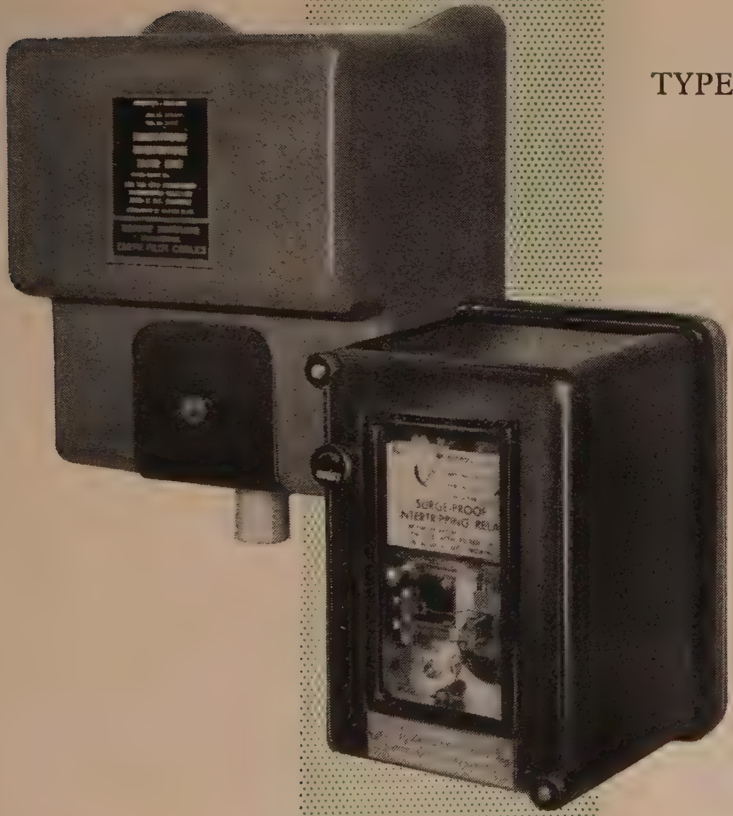

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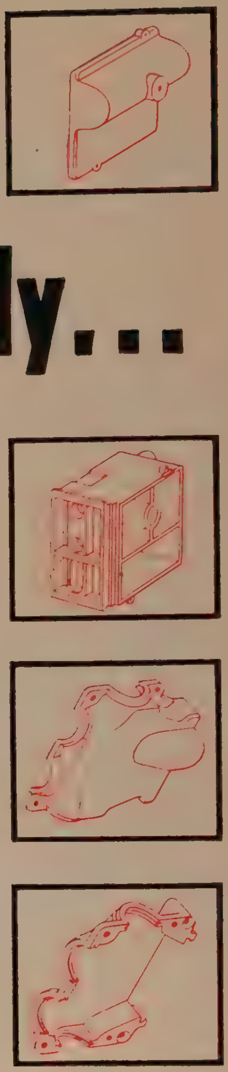

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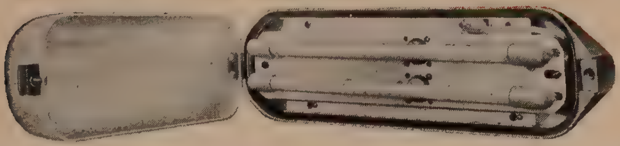

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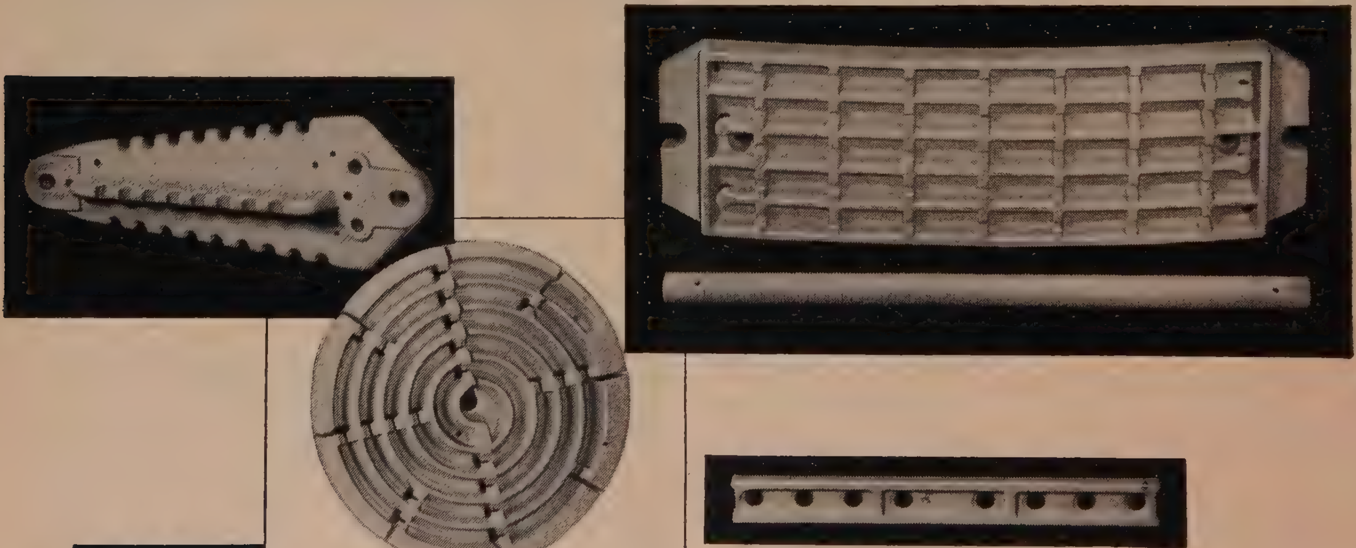

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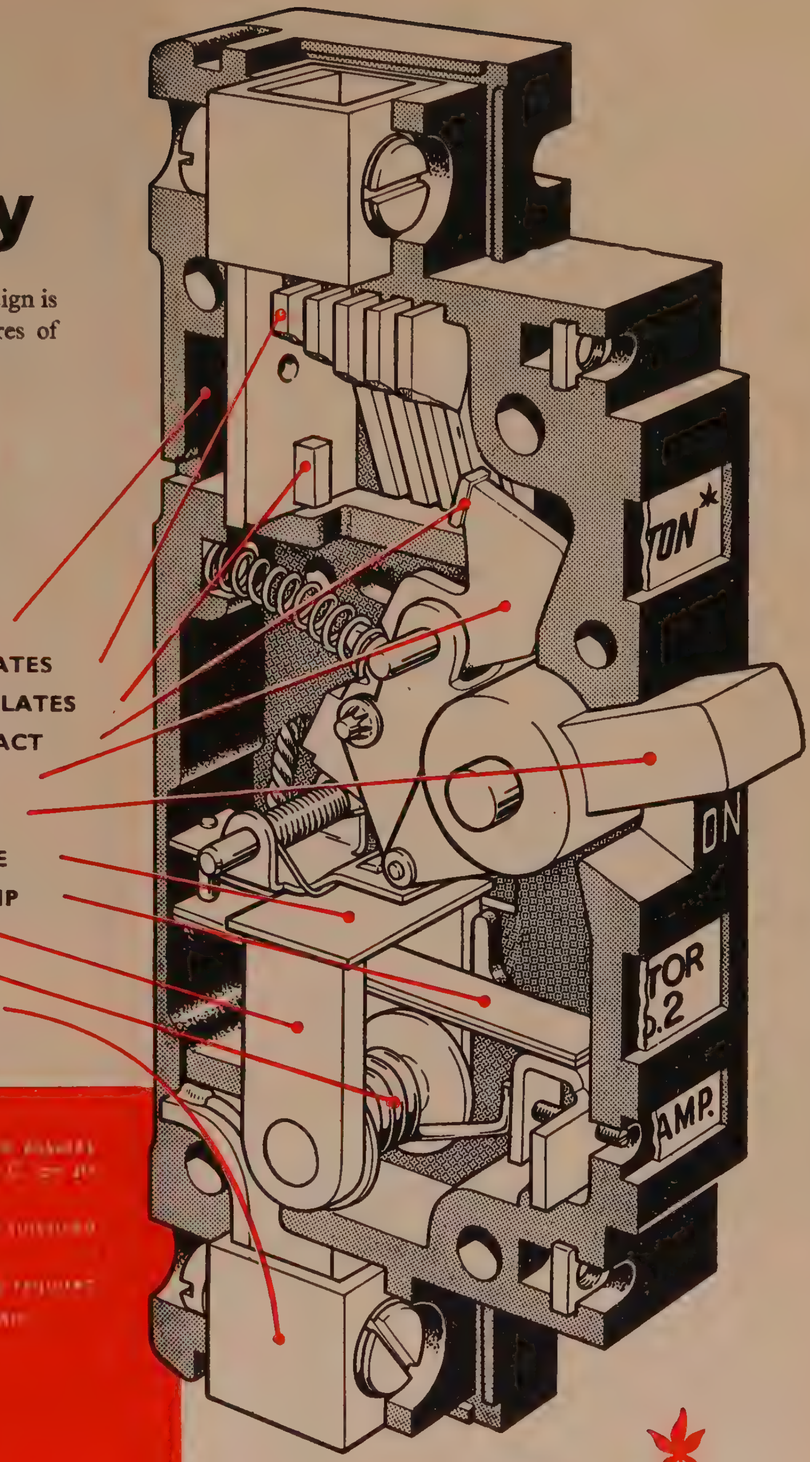

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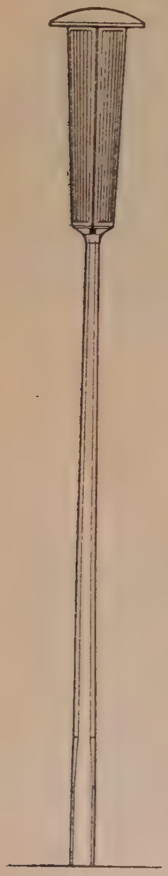

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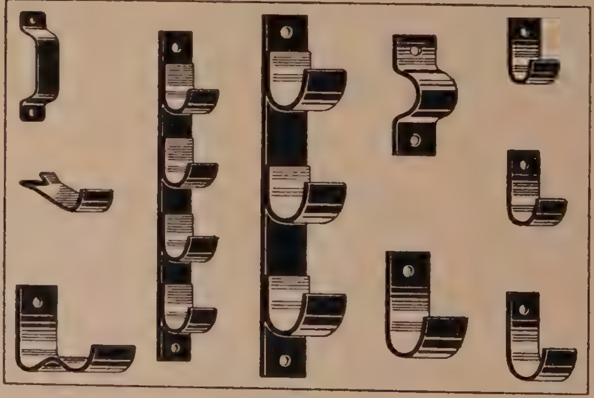

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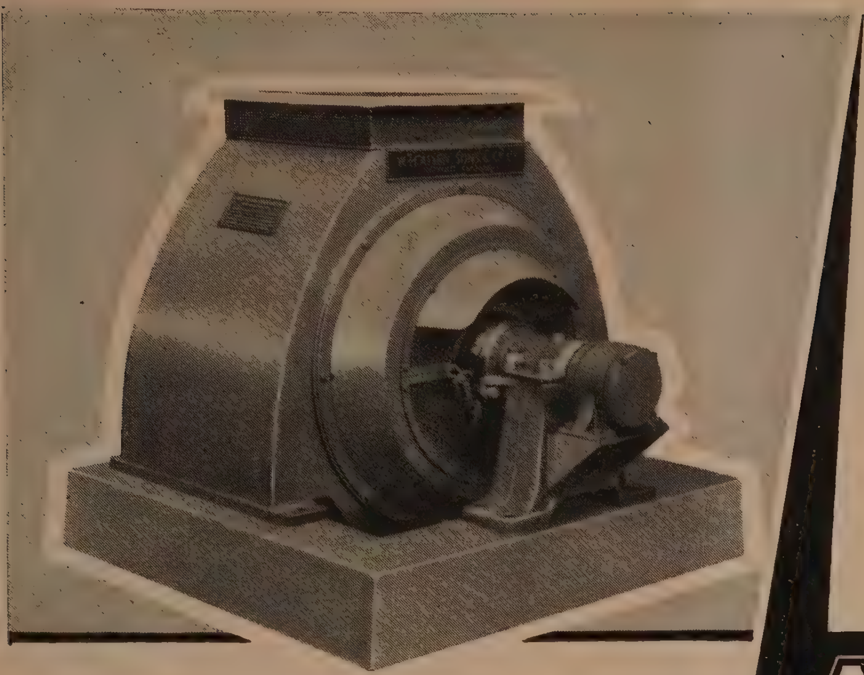

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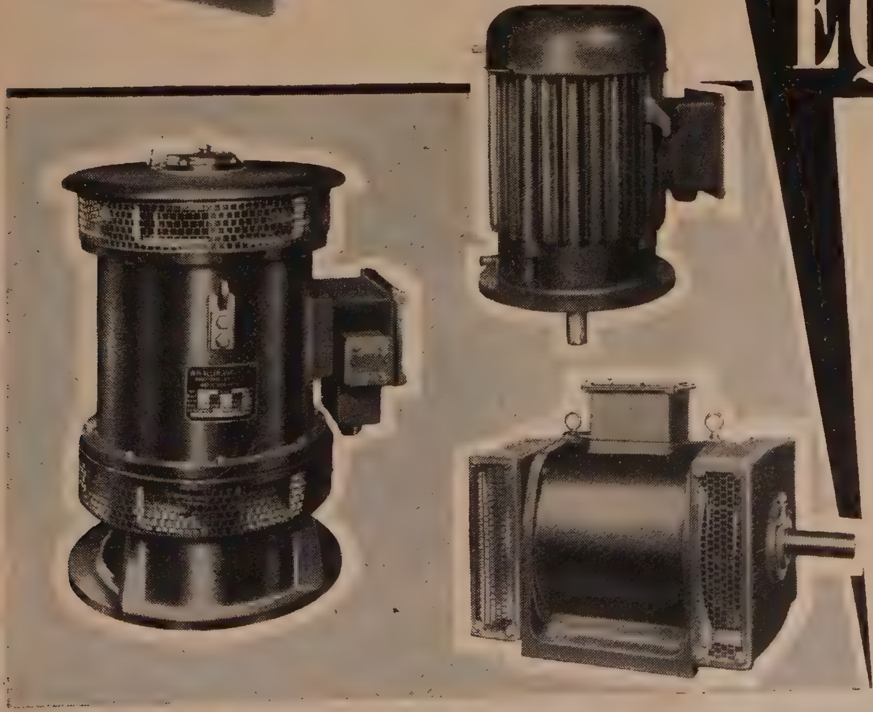

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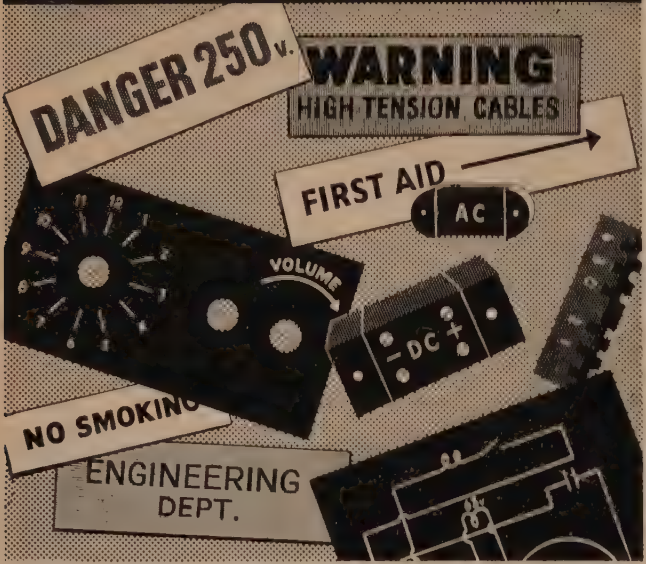

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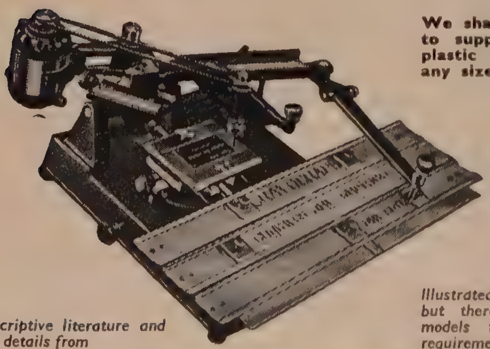

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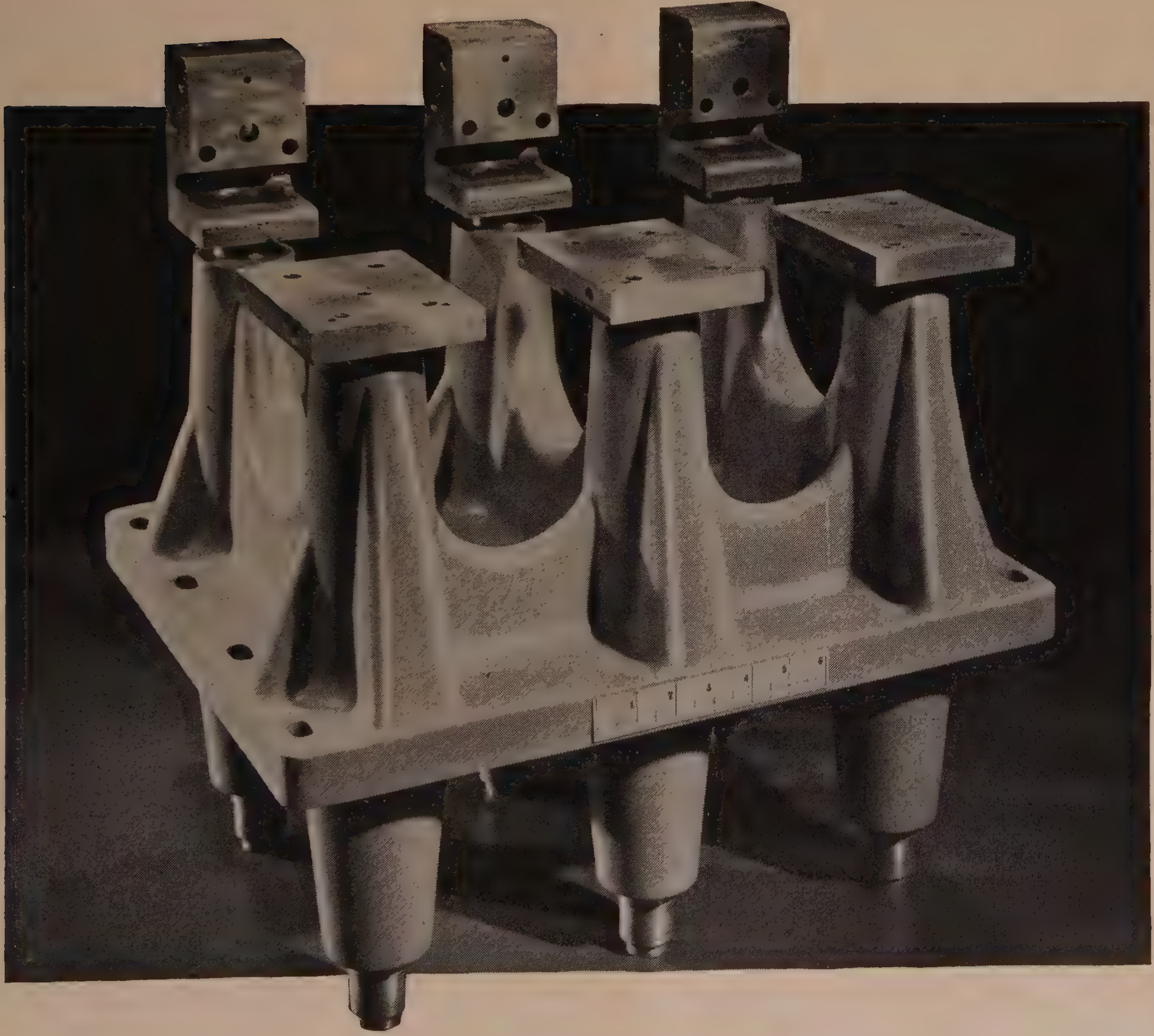

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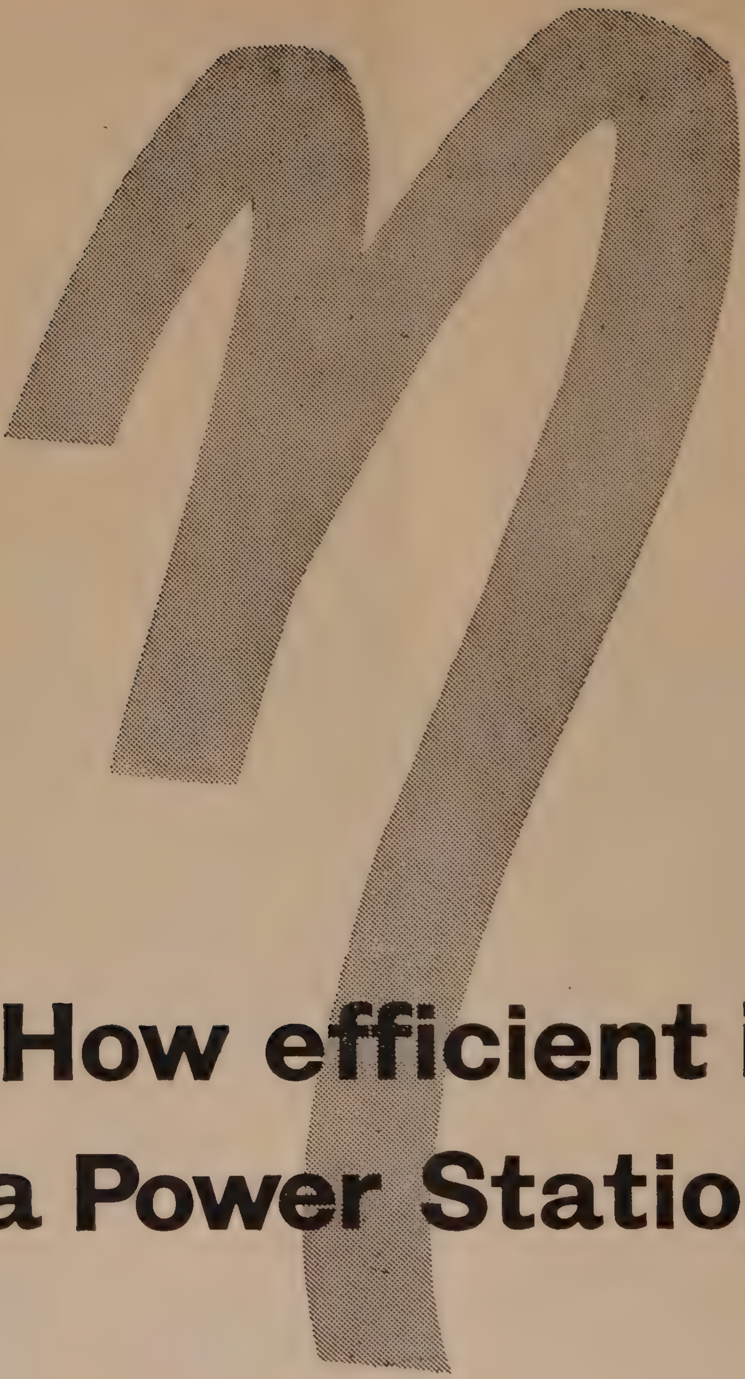

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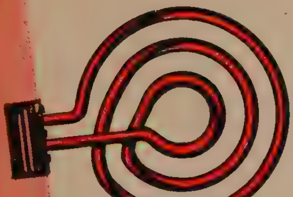
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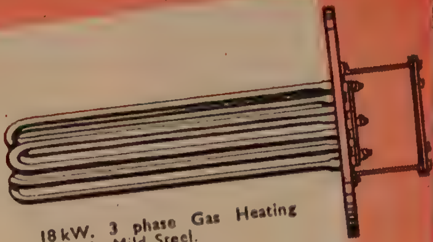
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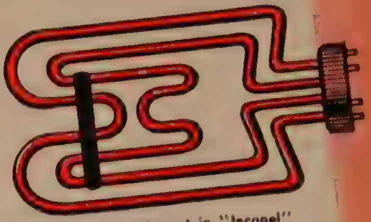
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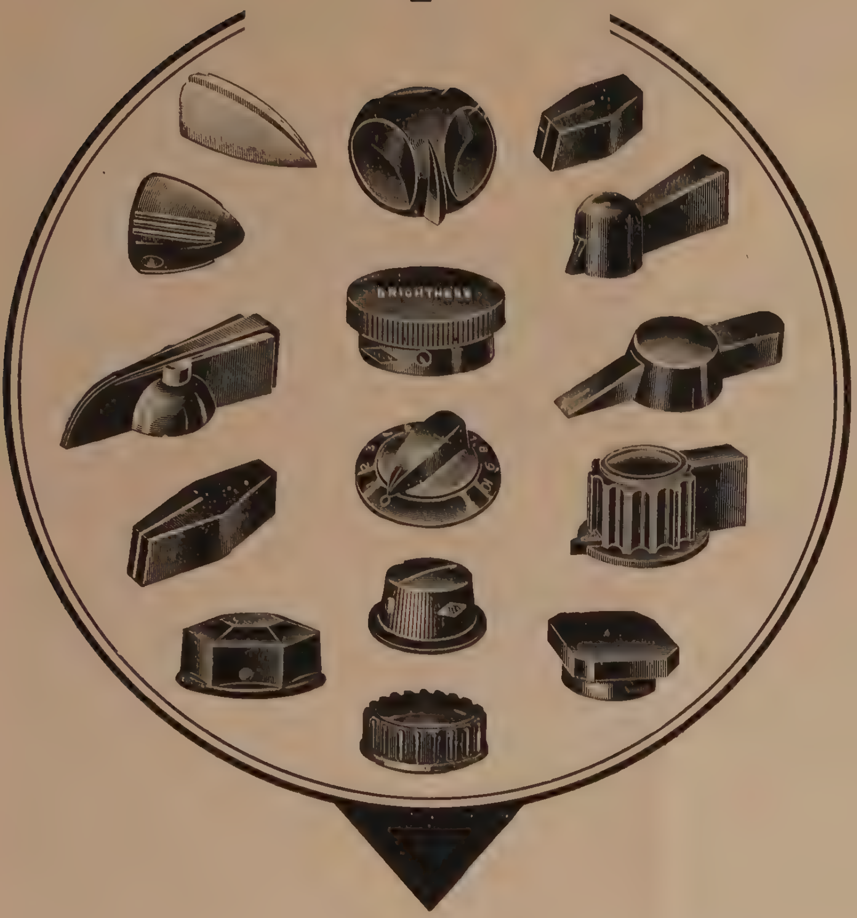

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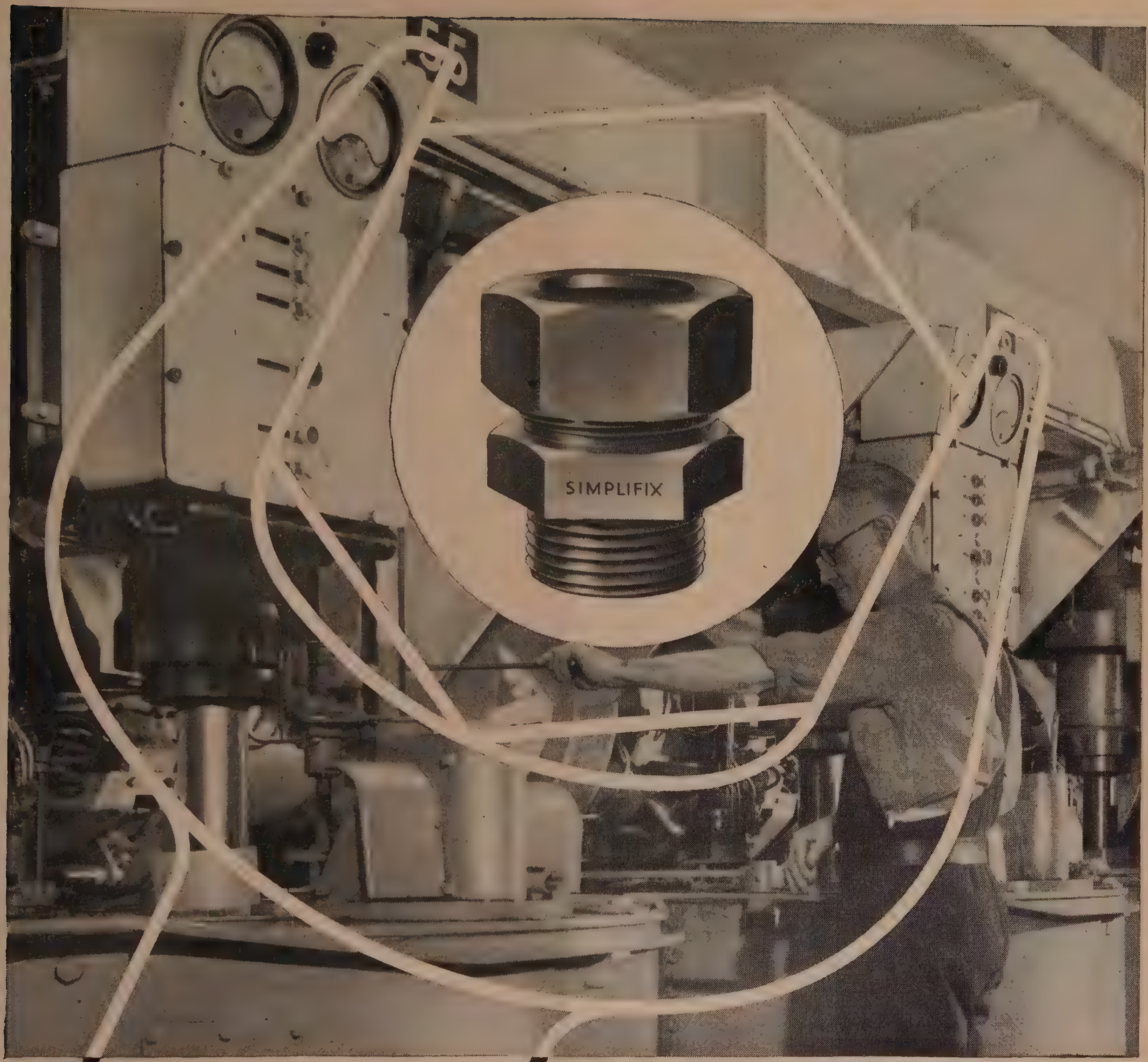

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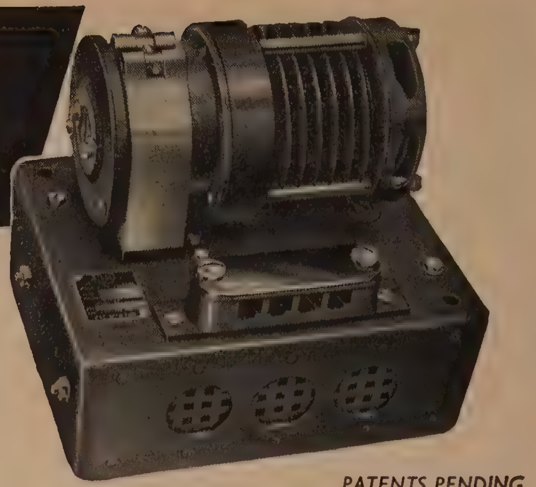

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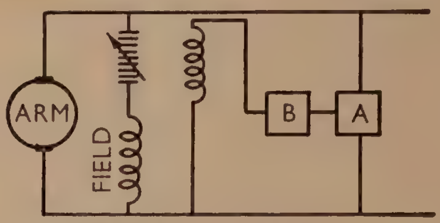

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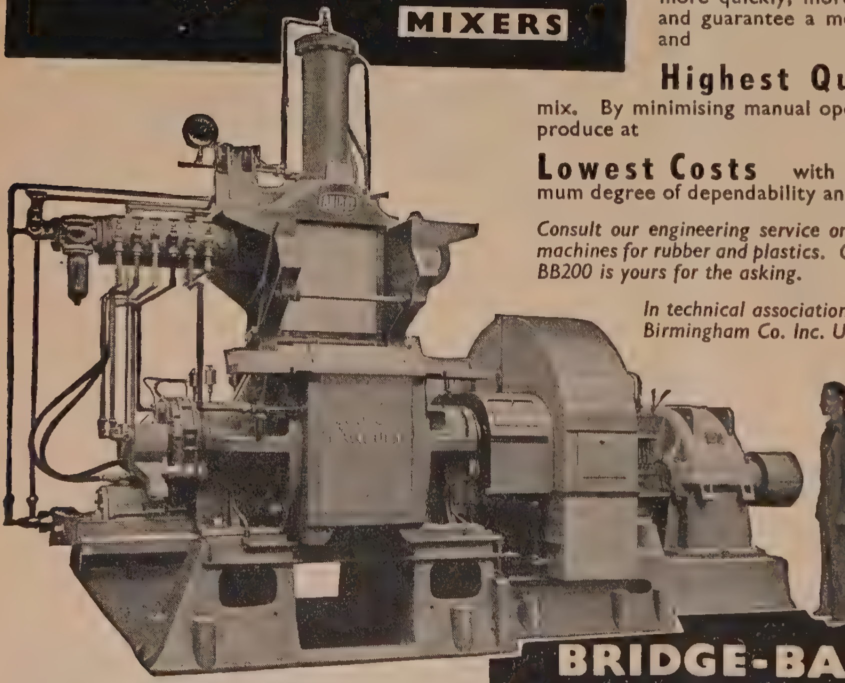

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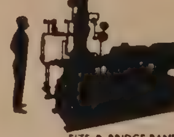

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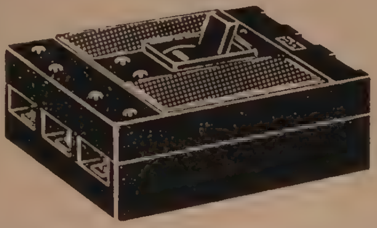

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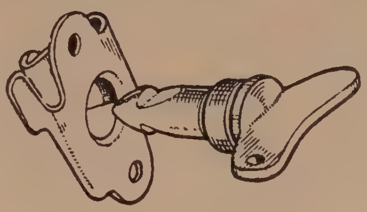

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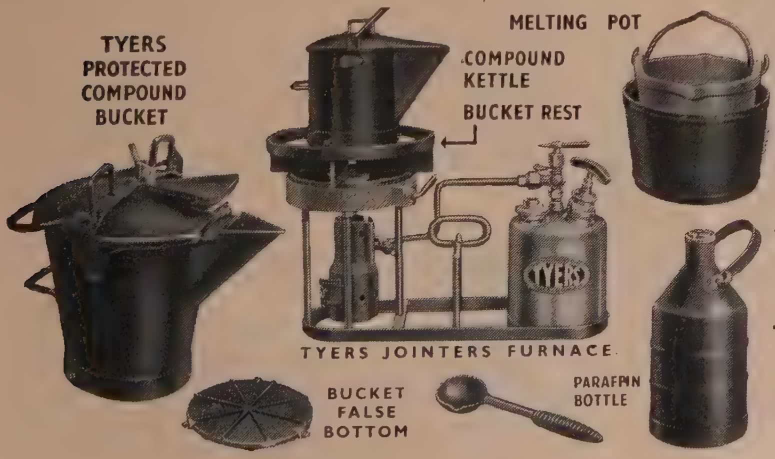

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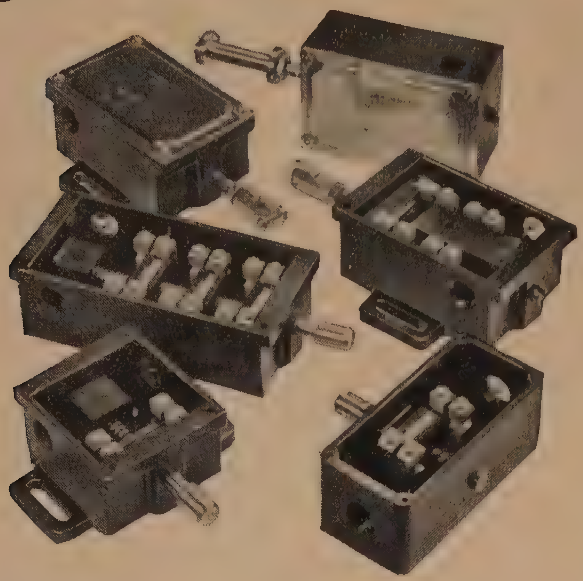

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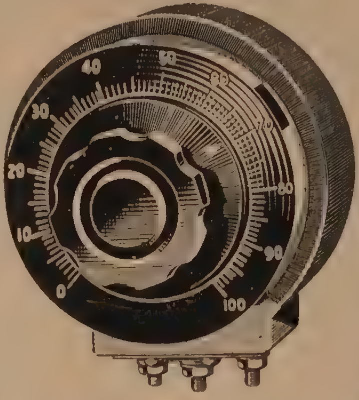

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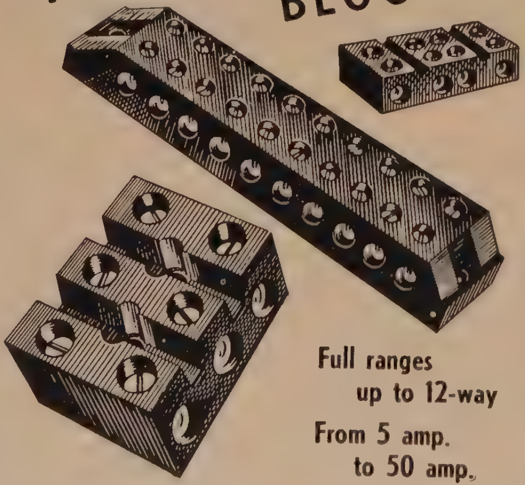

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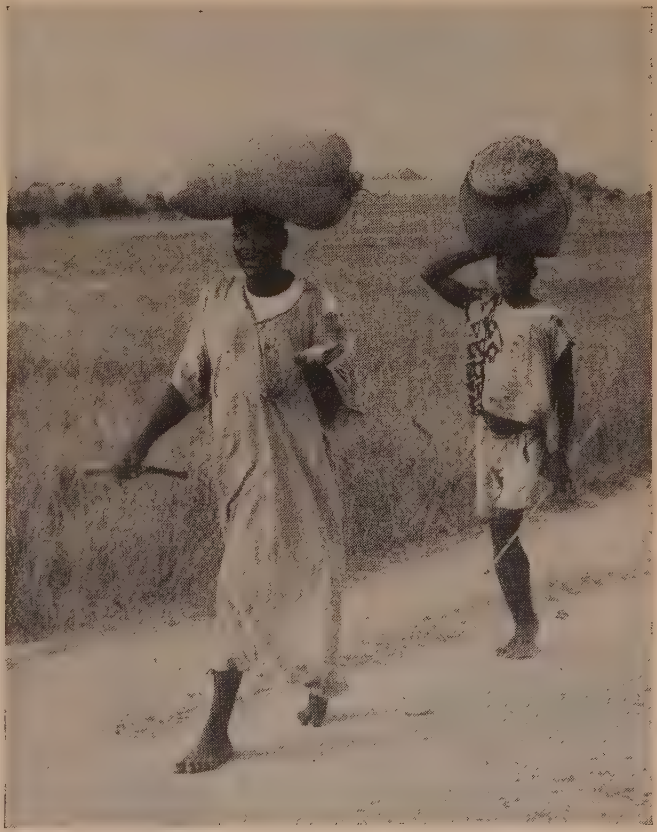

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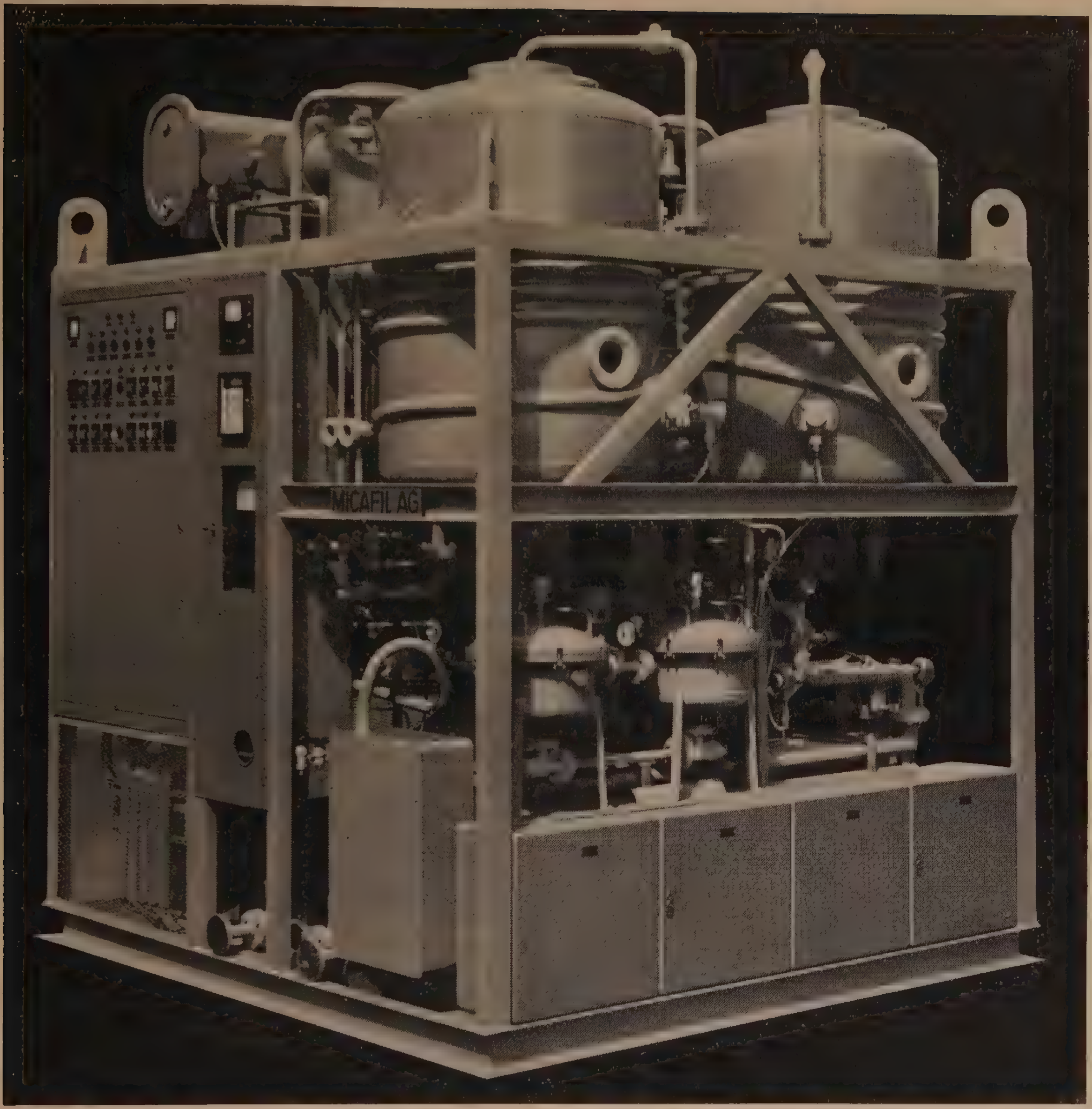

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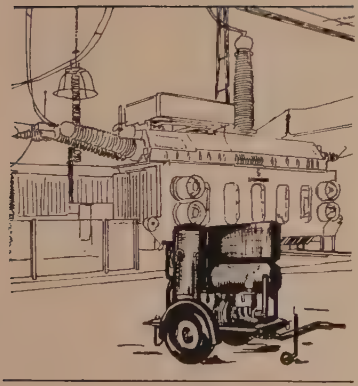

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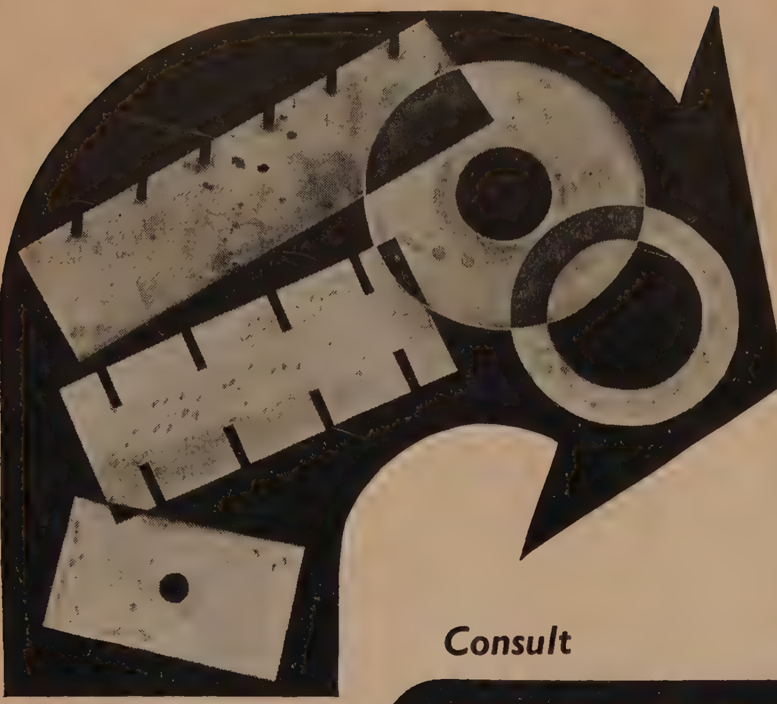

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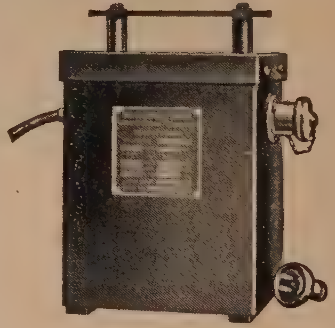

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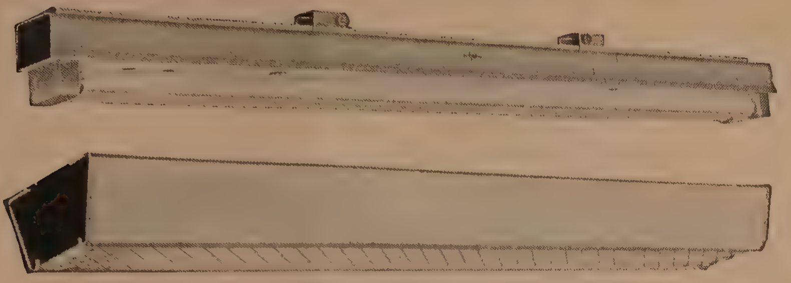

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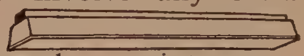
The varying lighting needs of office, works or showrooms *need not now* involve any extra expense on different fittings,  special installations or complex maintenance. With only the one basic fitting of **atlas atlantic** you can achieve the right light for every department, by a simple interchange of standard units. Create an attractive, *integrated* lighting system through the whole premises, at the same time increase efficiency and lower costs.

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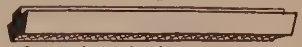
The unique features of the chassis, the quality and appearance of the fittings, the high efficiency of the fluorescent light,  and the very wide range of units bring you a new concept of low-cost lighting.

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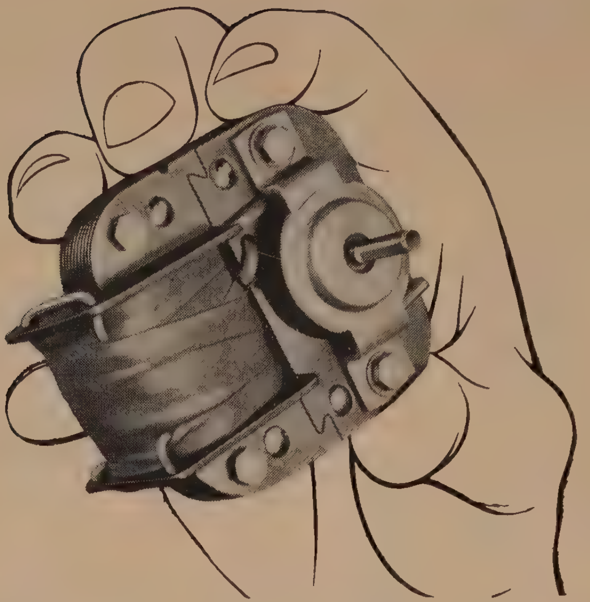

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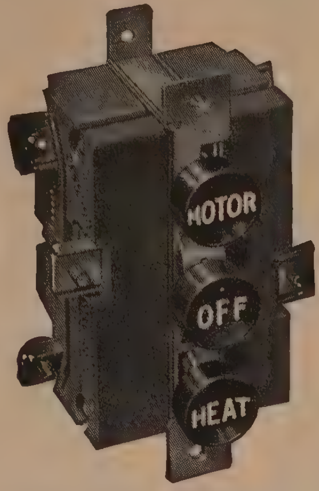

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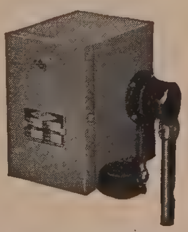
Two AC only 15 amp 250 v. D.P. Switches in one unit—ceramic insulation. Three varieties of operation—Independent, Interlocked sequence or Interlocked changeover. With or without manually reset Thermal trip for Heating Element and/or current overload trip for protecting Motor.

We shall be pleased to send full details.

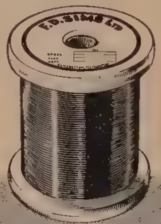
JELSON ELECTRIC LTD. PHONE: ACO. 0866
SPRING ROAD, TYSELEY, BIRMINGHAM 11

SAFETY FIRST

Special Heavy Industrial Lighting Brackets complete with Low Voltage Transformer to B.S.S.794
1, 2 or 3 Arm Brackets
Send us enquiries for your Low Voltage Equipment



MERITUS (BARNET) LTD.
BARNET, HERTS. **Bar. 2291/2**



"Sims 155"

COVERED WIRES

. . . a product of **F.D. SIMS LIMITED**

P.O. Box 8 Hazelhurst Works, RAMSBOTTOM, Manchester
Telephone: Ramsbottom 2213/4/5 *Telegrams:* "SIMS" Ramsbottom
London Office and Stores:
106 Newlands Park, Sydenham London S.E. 26
Telephone: SYDenham 4211/2

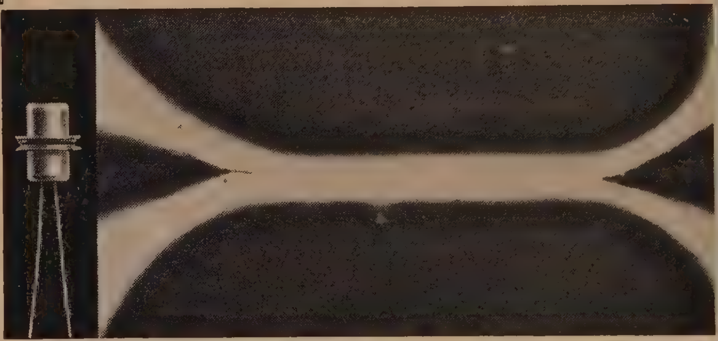
S51

3Q

PRODUCTION

G.E.C. original processes
now achieve
QUALITY · QUANTITY · QUICKLY

3Q production—quality, quantity — quickly! That's the ideal production combination for semiconductors we've now achieved with G.E.C. originated manufacturing processes. And it's because these new processes have so revolutionised our production that you can be sure of getting the G.E.C. devices you want — when you want them! We offer you the widest range in the country—at really competitive prices too!



G.E.C. was first with Cold-Welding research

For a long time it was no secret that soft metals could be pressure-welded, but it was G.E.C. research that finally led to the use of cold-welding as a commercial process. The G.E.C. process of surface cleaning by scratch-brushing or etching and pressing between carefully designed dies now produces the type of weld that is perfectly suited to semiconductor manufacture. A G.E.C. cold-welded copper envelope has complete metal-to-metal uniformity, excellent electrical conductivity and thermal properties. The process does not involve the application of heat or fluxes which could damage or contaminate the device. It is a measure of the quality of G.E.C. research that the techniques evolved from it are now in use throughout the world.

QUALITY · QUANTITY · QUICKLY

G.E.C. SEMICONDUCTORS

For information on the range of G.E.C. semiconductor devices please write to: G.E.C. Semiconductor Division, School Street, Hazel Grove, Stockport, Cheshire. Or in London area telephone TEMple Bar 8000, Ext. 10.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%: 26, 10%: 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

Advertisements are accepted up to **first post on Monday** of the week of issue

If displayed with boxed rules, name or symbol block by **Friday** prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

N.A.T.O. UNCLASSIFIED

N.A.T.O. COMMON INFRASTRUCTURE

SLICES VII AND VIII NAVAL BASE INSTALLATIONS

FINAL Notice is hereby given that International Competitive Bids will be invited on or about 27th April, 1960, for the

Supply and installation of the complete electrical installation for a P.O.L. storage depot to be constructed in the Loch Striven area of Scotland.

1. The system will be 415 volts, 3-phase, 4-wire, 50 cycles.

2. The approximate total value of the works is £55,000 and the contract will comprise :—

Switchgear and control equipment.
Cables for distribution, motors and controls.
Oil pipeline heating system.
Street and Area lighting.
Power and lighting in buildings.
Earthing and bonding.

3. The work will be carried out as one contract which will be undertaken as a sub-contract within the framework of the main contract for the construction of the depot. Bids for the main contract have been invited.

4. It should be noted that the importation of labour from sources outside the United Kingdom may be subject to restriction and that permission could, in any case, only be given on an undertaking that the contractor would pay the rates of wages and observe hours and conditions of labour not less favourable than those established for U.K. labour for the trade or industry in the same area.

5. The closing date for the receipt of bids will be 22nd June, 1960.

6. Firms wishing to bid must formally notify their desire by application to the address below by 23rd March, 1960.

7. Within one week after the closing date for the receipt of applications to bid, firms wishing to be invited must forward the following information :—

(i) Statement of financial resources and evidence of financial stability.

(ii) Details of recent major contracts completed for work of a comparable nature, including an indication of the value of each.

8. Enquiries regarding bidding should be addressed to :—

Director General, Navy Works,
Admiralty,
Chamberlain Way,
Pinner,
Middlesex, England,

quoting reference C.E.-in-C./Infra/9 (Sub-Contract Electrical Installation). 3665

COUNTY BOROUGH OF BLACKPOOL

TENDERS invited for :—

106 Group "B" Prestressed Spun Concrete Columns and Brackets for Fluorescent Lanterns.
106 Group "B" Fluorescent Lanterns, including control gear.
106 Synchronous Solar Dial Time Switches.

Specification, drawings, tender and general conditions from Director of Lighting and Electrical Services, Rigby Road East, Blackpool, to be returned by 10 a.m. on 28th March, 1960. 3680

COUNTY BOROUGH OF ST. HELENS

Street Lighting: Trunk Road A.580

TENDERS are invited for the supply and delivery of the following items of Street Lighting Equipment :—

1. 51 Group "A" spun concrete columns complete with brackets.
2. 51 140-watt sodium lanterns.
3. 51 sets lamps and auxiliary gear.
4. 4,150 yards P.V.C. insulated, S.W.A. armoured cable.
5. 1,000 yards T.R.S. cable.

Specification, form of tender and tender envelope may be obtained from the undersigned.

Tenders must be submitted, sealed in the envelope provided, bearing no name or mark to indicate the sender, to reach the Town Clerk, Town Hall, St. Helens, not later than 10 a.m. on Monday, 28th March, 1960.

The Corporation do not bind themselves to accept the lowest or any tender.

M. WARD, M.I.Mun.E.,
Town Hall, Borough Engineer.
St. Helens. 3679

COUNTY BOROUGH OF BLACKPOOL

TENDERS invited for :—

24 Group "A" Prestressed Spun Concrete Columns for post top fluorescent lanterns.
24 Group "A" Post Top Fluorescent Lanterns, including control gear.
864 Group "B" Prestressed Spun Concrete Columns for fluorescent lanterns.
864 Group "B" Fluorescent Lanterns, including control gear.
54 Group "B" Prestressed Spun Concrete Columns.
39 Special Prestressed Spun Concrete Columns.
132 approximately 6 ft. Extension Pieces for concrete columns.
100 Intermediate Fluorescent Lanterns, including control gear.
1,023 Synchronous Solar Dial Time Switches.

Specification, drawings, tender and general conditions from Director of Lighting and Electrical Services, Rigby Road East, Blackpool, to be returned by 10 a.m. on 28th March, 1960. 3681

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

TENDERS are invited for the supply and erection of 22 points of 140-watt Sodium Vapour electric discharge overhead lighting on 17 concrete columns, complete with cut-off type lanterns, lamps, leak transformers, capacitors and fuses for the illumination of a roundabout to be constructed at the junction of the Doncaster By-Pass Motorway with the London-Thurso Trunk Road (A.1) and North West of Doncaster-Kendal Trunk Road (A.638) at Redhouse, in the Doncaster Rural District.

Forms of tender and further particulars may be obtained from the County Engineer and Surveyor, County Hall, Wakefield.

The County Council do not bind themselves to accept the lowest or any tender.

Sealed tenders must be addressed to me, the undersigned, and received at Room 87, County Hall, Wakefield, not later than 12 noon on Monday, the 21st March, 1960.

BERNARD KENYON,
Clerk of the County Council.
County Hall,
Wakefield. 3637

COUNTY BOROUGH OF WIGAN

Streets Lighting Department

TENDERS are invited for the supply during the twelve months commencing 1st April, 1960, of the following materials :—

Class A and B Concrete Columns.
Class A and B Mercury Vapour Lanterns.
Class A and B Mercury Vapour Control Gear.
Electric Lamps.
Electric Cable.

Forms of tender are obtainable from the Borough and Water Engineer, Municipal Buildings, Hewlett Street, Wigan.

Tenders, enclosed in a plain sealed envelope and endorsed "Tender for Street Lighting Equipment," must be returned to me not later than the 21st March, 1960.

ALLAN ROYLE,
Municipal Buildings, Town Clerk.
Wigan. 3636

COUNTY BOROUGH OF BLACKPOOL

TENDERS invited for the supply of the following equipment for the Electrical Services Department :—

53 Medium Class Tubular Steel Poles.
116 Fibreglass Bases and Collars, for Steel Poles.

Specification, drawings, tender and general conditions from Director of Lighting and Electrical Services, Rigby Road East, Blackpool, to be returned by 10 a.m. on 28th March, 1960. 3609

ROYAL BURGH OF INVERKEITHING

Street Lighting: Trunk Roads A.90 and A.92

THE Town Council will shortly invite tenders for the supply and delivery of 40 lanterns and sets of auxiliary control gear suitable for a system of Sodium Discharge Street Lighting.

Contractors wishing to tender are invited to submit their names to the undersigned within seven days of the appearance of this advertisement.

WM. W. DUDGEON,
Burgh Chambers, Burgh Surveyor.
Inverkeithing, Fife. 3664

SITUATIONS VACANT

(See "Replies to Box Numbers" above)

THE COLNE VALLEY WATER COMPANY

invite applications for the appointment of
ASSISTANT MECHANICAL AND ELECTRICAL ENGINEER.

Applicants must have a sound training, with workshop and drawing office experience, and should have a professional qualification.

The appointment will be permanent and pensionable and the salary range will be from £1 015 to £1,260 per annum, depending upon qualifications and experience. A car allowance will be payable.

Applications should be addressed to John Christie, B.Sc., M.I.C.E., M.I.W.E., Chief Engineer, The Colne Valley Water Company, Aldenham Road, Watford, Herts., and should arrive not later than 18th March, 1960. 3610

***Situations Vacant** (continued)*

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

FOURTH ASSISTANT ENGINEERS,
TELECOMMUNICATIONS SECTION,
DIVISIONAL TECHNICAL DEPT.
(Vacancy No. 42/60/ER).

Applications are invited for two positions as Fourth Assistant Engineer in the Telecommunications Section of the Technical Department, one of these vacancies being at Divisional Headquarters and the other at the Northern District Technical Office in Nottingham.

Applicants should be thoroughly familiar with automatic telephone type circuitry and equipment. They should also preferably have some experience of V.F. signalling, carrier equipment or radio. The qualifications required are Higher National Certificate standard, or City and Guilds equivalent telecommunications certificates.

Salary will be in accordance with Class AX/EX, Grade 7 (£840-£1,065 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 19th March, 1960.

FOURTH ASSISTANT ENGINEER,
TRANSMISSION DEPARTMENT,
DIVISIONAL HEADQUARTERS
(Vacancy No. 47/60/ER).

Experience in maintenance and operation of 132-kV transmission lines and substations essential.

Candidates should preferably have qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary will be in accordance with Class AX/EX, Grade 7, £840-£1,065 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications, 25th March, 1960.

ASSISTANT ENGINEER (Mechanical),
STAYTHORPE "A" AND "B"
POWER STATION
(Vacancy No. 48/60/ER).

Applicants should have received a sound technical training and have had wide practical experience in the maintenance of power station mechanical plant.

The salary will be in accordance with Class L, Grade 8 (£1,195-£1,270 per annum) of the National Joint Board Agreement and will be reclassified to Grade M from 1st July, 1960.

Closing date for receipt of applications, 18th March, 1960.

GENERAL ASSISTANT
ENGINEER (Chemist),
SPONDON POWER STATION
(Vacancy No. 52/60/ER).

Applicants should have had a sound technical training and previous laboratory experience, and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

Salary will be in accordance with Class J, Grade 16 (£610-£655 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th March, 1960.

ASSISTANT ENGINEER (Instruments),
CASTLE DONINGTON
POWER STATION
(Vacancy No. 53/60/ER).

Applications are invited from suitably qualified men for the position of Assistant Engineer (Instruments) at Castle Donington Power Station.

The selected candidate will be required to assist the Instrument Engineer in the maintenance, calibration and testing of modern power station instruments and controls.

Applicants should have sound technical qualifications and training, a knowledge of electronics and manufacturing experience would be an advantage.

The salary will be in accordance with Class L, Grade 10 (£1,025-£1,085 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 18th March, 1960.

FOURTH ASSISTANT ENGINEER,
COVENTRY SECTION
(Vacancy No. 54/60/ER).

Applicants should have experience of maintenance and operation of E.H.T. overhead lines, transformers and switchgear.

Preference will be given to candidates with qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

Salary will be in accordance with Class AX/EX, Grade 8 (£735-£960 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 25th March, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.

3rd March, 1960. 3670

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Dundee Area

Foreman Jointer

Appointment in No. 3 (Dundee City) District of the Area

APPLICANTS must be first-class craftsmen and plumber-jointers, capable of jointing, and supervising jointing, up to and including 33 kV. Some theoretical knowledge will be of advantage.

The successful applicant will be required to live in Dundee and must be an energetic man possessing keenness and initiative, capable of organising and supervising work involving large labour groups of craftsmen and others. Ability to drive a car will be of advantage.

The salary and conditions will be according to N.J.I.C. Agreement, Schedule E for Foremen, Grade III, at £660 per annum.

Superannuation scheme is applicable.

Application form obtainable from the Area Manager, 7, Dudhope Crescent Road, Dundee, and should be completed and returned not later than 26th March, 1960. 3660

FEDERAL POWER BOARD OF RHODESIA AND NYASALAND

Resident Transmission Maintenance Engineer

APPLICATIONS are invited for the appointment of a RESIDENT TRANSMISSION MAINTENANCE ENGINEER in the Board's Transmission System Maintenance Organisation. The Board is at present constructing 900 miles of 330-kV transmission line and a number of substations.

Applicants should have had substantial experience in the maintenance of high-voltage transmission lines and substations, and should have had an appropriate technical education. Salary £1,650 per annum. The successful applicant will be required to contribute to the Board's pension fund. His duties will be concerned with the maintenance of the 330-kV transmission system, and he will be expected to take part in the overhaul of electrical plant. The successful applicant will be stationed at Sherwood Control Centre. Housing and hard furniture will be provided by the Board at a reasonable rental in the town of Que Que (where there is a full range of Federal Government Schools), about 16 miles from Sherwood. Transport between Sherwood and Que Que will be provided. The reasonable transfer and removal expenses of the successful applicant and his family to Que Que will be paid by the Board.

Applications giving full details of education, training, experience, age and marital status should be posted so as to reach the Secretary, Federal Power Board, Reliance House, Moffat Street, P.O. Box 630, Salisbury, Southern Rhodesia, not later than 1st April, 1960. 3561

HARTLEY ELECTROMOTIVES LIMITED, SHREWSBURY

require the services of Electrical Estimator, or electrician willing to train for this progressive position. Good salary dependent on experience. Staff privileges. Modern office with ideal working conditions. Pension scheme. Housing assistance if required.

Apply General Manager, Wiring Systems Division. 3565

ATOMIC ENERGY RESEARCH ESTABLISHMENT

HARWELL

offers excellent opportunities for

DESIGN ENGINEERS

to design NUCLEAR PHYSICS EQUIPMENT for NIMROD the 7 GeV PROTON SYNCHROTRON now under construction for the NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE.

The posts call for :

MECHANICAL DESIGN ENGINEERS

Corporate Membership I.M.E. or equivalent qualifications. Experience in mechanical engineering design.

ELECTRICAL DESIGN ENGINEERS

Corporate Membership I.E.E. or equivalent qualifications. Design experience of a variety of electrical work.

ASSISTANT DESIGN ENGINEERS

Apprenticeship, H.N.C. or equivalent Mechanical engineering design experience or experience of electrical control systems and light current electrical equipment.

SALARY : £860-£1,825 p.a., starting salary according to age, qualifications and experience.

Send POST CARD for details and application form to the Group Recruitment Officer (1606/48), U.K.A.E.A., A.E.R.E., Harwell, Didcot, Berks.

3687

VICKERS-ARMSTRONGS (AIRCRAFT) LTD.

WEYBRIDGE, SURREY

require immediately

ELECTRICAL & ELECTRONIC ENGINEERS

to engage in a long term and intensive Design Programme for a series of new

CIVIL & MILITARY AIRCRAFT

including

VANGUARD — VC 10 & DEVELOPMENTS — TSR 2 — SWALLOW

ELECTRICAL ENGINEERS

(Minimum qualification H.N.C. or equivalent).
For the design and engineering of airborne electrical generation and utilisation systems, and the associated control, protection and consumer equipment.

ELECTRICAL DEVELOPMENT ENGINEERS

(Minimum qualification H.N.C. or equivalent).
For development work in the Electrical Systems Laboratory on airborne generation systems and associated control and protection equipment and various duties associated with approval and lifing of aircraft electrical components.

ELECTRONIC ENGINEERS

(Minimum qualification H.N.C. or equivalent).
The duties will include the integration of complete communication, navigation and flight control systems and other airborne electronic equipment with particular reference to technical performance, reliability and failure analyses. Selected engineers may be required to specialise on particular aspects to act in a consultant capacity.

INSTRUMENTATION ENGINEERS

(Minimum qualification H.N.C. or equivalent).
For the design of flight test instrumentation systems in conjunction with the Design and Flight Test Departments.

ELECTRICAL/ELECTRONIC DRAUGHTSMEN

(O.N.C. or equivalent qualification desirable).
For the design of aircraft installations and associated circuitry.

INSTRUMENTATION DRAUGHTSMEN

(O.N.C. qualification desirable).
For circuit design and installation layout.

Previous experience with airborne systems is desirable but consideration will be given to suitably qualified applicants with experience in allied industries. A number of appointments carry monthly staff status and all are permanent for those with adequate qualifications. Attractive salaries, prospects and pension scheme.

Applications are requested in writing to:—

The Design Manager, Brooklands Rd., Weybridge, Surrey

3427

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. Stations. The work of Station Engineer (G.D.) consists of installation, operation and maintenance of high and medium voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage. Station Engineers (Mech.) are concerned with diesel power plant, steam and hot water heating systems, refrigeration and air conditioning and miscellaneous workshop plant, tools and equipment.

Commencing salary according to age, qualifications and experience. Salary ranges £680 to £850.

Candidates must hold O.N.C. Elect. or Mech., City and Guilds Electrical Technician's Certificate, 2nd Class M.O.T. Certificate or equivalent, and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidates with supervisory experience.

Opportunities for promotion up to Technical Grade A, maximum salary £1,565 (national rate) and pension prospects. Five-day week; three weeks three days leave a year initially. Internal training courses are provided and attendance at technical colleges by suitable candidates is sponsored. Overseas tours for which special allowances are payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 55 years.

Write stating age, qualifications and experience to Manager (P.E.1), Professional and Executive Register, Ministry of Labour, Atlantic House, Farringdon Street, London, E.C.4. No original testimonials should be sent. Only applicants selected for interview will be advised.
262

LONDON COUNTY COUNCIL

South East London Technical College
Lewisham Way, S.E.4

LECTURER and ASSISTANT, GRADE B, in electrical engineering, required.

Salary scales, Lecturer, £1,370 × £35 to £1,550; possible entry above minimum if justified by experience and present position. Assistant, Grade B, within the range £738 to £1,486. Commencing salary and maximum according to age, qualifications and experience.

Application forms from Secretary of College, returnable within two weeks of advertisement date. (482.) 3691

RELIANCE CORDS & CABLES LTD.

SENIOR INSPECTOR

for Cable Factory, London District, manufacturing rubber and plastic cable principally for the telecommunications industry. Experience of Government inspection procedures preferable.

TECHNOLOGIST

with experience in the handling and testing of materials for the foregoing types of cable.

Apply in writing with particulars of previous experience to:—

Chief Engineer
RELIANCE CORDS & CABLES LTD.
Fingal Works, Staffa Road
Leyton, London E.10

when arrangements for an interview will be made.
3596

SOUTH OF SCOTLAND ELECTRICITY BOARD

Edinburgh and Borders Area

General Assistant District Commercial Engineer, Borders District

Salary N.J.B. Schedule A, Class F, Grade II, £710/£755 per annum

APPLICATIONS are invited for the appointment of a GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER in the Borders District, based on Berwick-on-Tweed, and should be submitted to the undersigned not later than 25th March, 1960.

Duties will include supervision of electrical contracting work under the First Assistant District Commercial Engineer. The applicant should have experience in domestic, commercial and farm installations. Possession of an O.N.C. or equivalent technical qualifications will be an advantage.

Conditions of service are in accordance with the National Joint Board Agreement for the Electricity Supply Industry, and the successful candidate, subject to satisfactory evidence of health, will require to become a contributor to the Board's superannuation scheme.

The successful candidate will require to reside within a reasonable distance of the Section Office at Berwick.

C. H. A. COLLYNS,
Manager.
52, Melville Street,
Edinburgh, 3.
3661

HOME ECONOMIST

THE makers of "Satchwell" Thermostats and other controls for domestic electric appliances require a HOME ECONOMIST to help in development work. She will spend most of her time in Slough, but there will be some travelling for demonstrations.

Applications from girls aged 25-30, with E.A.W. Diploma and demonstration experience, to the Personnel Manager, The Rheostatic Co. Ltd., Farnham Road, Slough, Bucks. 3616

***Situations Vacant** (continued)*

SOUTHERN ELECTRICITY BOARD

Field Engineers (Construction)
Four Vacancies

Sub-Area Engineering Department of No. 3 (Portsmouth) Sub-Area. Salary, in each case, N.J.B. Class L, Grade 13 (£860 × £15 to £905 per annum). N.J.B. conditions of service.

The duties of the post will be to carry out site supervision, installation and erection of plant, equipment and overhead lines, the laying of cables and other constructional work on all distribution systems up to and including 33 kV.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1174, not later than 21st March, 1960.

Assistant Engineer
(Maintenance and Operation)

Isle of Wight District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class F, Grade 9 (£815 × £15 to £860 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1175, not later than 21st March, 1960.

General Assistant Engineer

Southampton District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class G, Grade 12 (£710 × £15 to £755 per annum). N.J.B. conditions of service.

The successful candidate will be required to give general assistance in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in electricity supply distribution and the possession of suitable technical qualifications would be an advantage.

The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1173, not later than 21st March, 1960.

Demonstrator

Weymouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.C. Grade 1 (£525-£625 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1159, not later than 21st March, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme. 3688

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts :—

Central Gloucestershire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER (Gloucester).

Applicants should have had a sound technical training and experience in the construction, operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. Salary £815/£860 per annum (N.J.B. Grade F.9).

THIRD ASSISTANT DISTRICT ENGINEER (Stroud).

Duties will include the construction, maintenance and operation of H.V. and L.V. mains and substations, and planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary £765/£810 per annum (N.J.B. Grade E.9).

Apply by letter, within 14 days, stating age, experience, present position and salary to Mr. S. Raybould, Sub-Area Manager, Midlands Electricity Board, Eastern Avenue, Gloucester.

Shropshire and Herefordshire Sub-Area

FOREMAN ELECTRICAL FITTER (Headquarters).

Applicants must have wide experience in substation construction work and be capable of supervising and controlling men engaged in this type of work. Conditions of service and salary (£725 per annum, Schedule E, Grade 2) in accordance with N.J.I.C. Agreement.

The successful applicant will be based at Sub-Area Headquarters, Ditherington, Shrewsbury, and must be prepared to work and lodge away from home on occasions.

Apply by letter stating age, experience and present position to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

F. W. CATER,
Secretary. 3662

CAMEROONS DEVELOPMENT CORPORATION

Required for Service in the **Southern Cameroons** (Nigeria)
under United Kingdom Administration :—

ELECTRICAL ENGINEER, aged over 30. Candidates should be Corporate Members of the Institution of Electrical Engineers and must have a wide practical experience. The successful candidate will be in charge of all Electrical work in the Corporation and will be responsible for industrial and domestic installations and maintenance, H.T. and L.T. distribution systems, generating equipment, C.B. and PAX telephone systems and refrigeration equipment. Incremental salary scale in range £1,425-£1,750, point of entry according to experience.

ELECTRICAL SUPERVISOR, aged over 30. Candidates must have served a recognised apprenticeship and possess the Ordinary National Certificate in Electrical Engineering. The selected candidate will be in charge of workshops, undertaking the repair and maintenance of industrial and domestic electrical equipment, and will be responsible for maintenance and installation work over a large area. Practical experience of industrial and domestic installations, H.T. and L.T. distribution systems is required. Knowledge of C.B. and PAX telephone systems and refrigeration is desirable. Incremental salary scale in range £1,075 - £1,565, point of entry according to experience.

Free passages are provided to and from the Cameroons for officers and their wives and up to two children, together with free furnished accommodation during residence in the Cameroons; a reasonable amount of free lighting and fuel is also provided. An outfit allowance of £80 is payable on first appointment; children's allowances are payable up to a maximum of two at the rate of £75 each. Officers are required to contribute 10% of their salary to a provident fund, the Corporation contributing 15%.

Tours are of about 18 months with one week's leave on full pay for each completed month of service if the officer is returning for further service, otherwise half this amount of leave.

Applications, giving full particulars in writing, to :—

Rubber & Mining Agencies Ltd., 52, Leadenhall Street, London, E.C.3

Acknowledgement will only be made to applicants selected for further consideration.
3686

THE BRITISH ELECTRICAL AND ALLIED MANUFACTURERS' ASSOCIATION

SECRETARY
OVERSEAS DIVISION

THIS senior position in the Association has become vacant and offers an exceptional opportunity for a man of the right outlook and experience.

Electrical manufacture is one of Britain's leading export industries, and the Overseas Division of the British Electrical and Allied Manufacturers' Association has the responsibility for backing the export efforts of the industry through commercial intelligence, liaison with Government Departments and contact with overseas markets. The Secretary of the Overseas Division will have responsibility for all this work under the Head of the Division and will be required to exercise initiative and take responsibility.

Candidates should preferably be between 40-50 years and have experience of overseas trading and knowledge of international affairs. Languages and an engineering background will be an advantage. The post, which is superannuable, carries the normal salary range of £2,250 to £2,750 ; the commencing salary will depend on qualifications and experience.

Applications, which will be treated in the strictest confidence, should be addressed to the Secretary of the Association, at 36, Kingsway, London, W.C.2, and should arrive not later than the 21st March, 1960.
3695

AIR MINISTRY

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS required for design, construction and maintenance of installations on airfields, radar stations, missile bases, workshops and maintenance units for R.A.F. at home and overseas, as well as certain Civil Airports.

Salary £805 at 25 to £1,095 at 34 or over, thereafter rising to maximum £1,260, with increase for London and slight decrease for country districts. Appointments non-pensionable but long term. Promotion prospects. 5-day week with 4 weeks 2 days leave a year initially. Special allowance in addition to salary during overseas service. Qualifications and experience:

(i) (a) University Degree or equivalent diploma in electrical and/or mechanical engineering, with at least 2 years' apprenticeship; or
  (b) Graduate or Corporate Member of I.E.E., with at least 3 years' apprenticeship; or
  (c) Graduate or Corporate Member of I.Mech.E., appreciable electrical engineering experience, with at least 3 years' apprenticeship ; and
(ii) Have been employed for minimum of 2 years with well-established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural-born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting D.158/OA. 263

CABLE SALESMAN

required by medium sized progressive company to sell thermoplastic cables in N.W. England. Must have experience of wiring cables, flexibles, armoured types, etc., and established connections in these fields. Excellent salary and conditions. Pension scheme. Car provided.

Write in absolute confidence to—Box 3597.

DESIGN AND DEVELOPMENT

of

POWER TRANSFORMERS

with

'ENGLISH ELECTRIC'

STAFFORD

PRODUCTION expansion gives rise to a number of professional engineering appointments in the heavy transformer design and development group.

The department covers the range of power transformers 30 MVA—300 MVA, heavy duty rectifier transformers, power system chokes and reactors.

The more senior appointments in this field necessitate previous design experience, though more junior qualified engineers interested in this class of work are also invited to apply, particularly with regard to the experimental development work.

If you would like to visit Stafford to discuss these openings, please write giving full details to Dept. C.P.S., Marconi House, 336/7, Strand, London, W.C.2, quoting reference ER.1296F.

3678

THE SCHOOL OF ENGINEERING

KUMASI COLLEGE OF TECHNOLOGY, GHANA

UNDER a rapidly developing expansion programme, the College invites applications for the following posts :—

Civil Engineering

SENIOR LECTURERS and LECTURERS in

- (a) Hydraulics.
- (b) Engineering Structures.
- (c) Soil Mechanics.
- (d) Properties of Materials.
- (e) Land Surveying.

Mechanical Engineering

THE HEAD OF DEPARTMENT.

SENIOR LECTURER IN STRENGTH OF MATERIALS.

LECTURERS in

- (a) Strength of Materials.
- (b) Theory of Machines.
- (c) Engineering Drawing.

Electrical Engineering

SENIOR LECTURERS or LECTURERS in

- (a) Generation and Distribution.
- (b) Telecommunications.

A good Degree in Engineering is necessary for all posts, except the Lectureship in Surveying, for which the Professional Associate of the Royal Institution of Chartered Surveyors is acceptable. Postgraduate industrial and/or teaching experience is essential for all posts.

Contract appointments are normally for five years, and may be renewed. Three months' notice of resignation of an appointment is required.

The contract salary scales are :—

Head of Department:
£3,430 × £112 10s. to £3,767 10s. p.a.

Senior Lecturer:
£2,370 × £90 to £2,910 p.a.

Lecturer Grade A:
£1,987 10s. × £75 to £2,437 10s. p.a.

A gratuity at the rate of £150 a year is payable at the end of a contract period. Children's allowances are paid up to a maximum of three.

The School is recognised by London University for the B.Sc. (Engineering) Degree, and the first group of students graduated in 1959. Courses are also conducted for the examinations of the Royal Institution of Chartered Surveyors.

The School of Engineering has very well-equipped laboratories and workshops, besides the usual staff rooms, lecture rooms and drawing offices. Ample facilities for research are available.

The College is fully residential, and members of staff are housed in pleasant, modern bungalows on the spacious campus; climate and living conditions are good.

Application forms and an information brochure may be obtained from the Assistant Registrar (reference ER/E), Kumasi College of Technology, 29, Tavistock Square, London, W.C.1, who will also be glad to answer any questions about these appointments.

The Principal of the College will be in London to interview candidates for these posts in April.

3663

DEVELOPMENT ENGINEER

Assistant Development Engineer

required for interesting development work in Electrical and Mechanical Light engineering equipment. Applicants should possess a Higher National Certificate in Electrical Engineering or equivalent. Previous experience in development work and product testing is required. A knowledge of modern manufacturing process is also desirable.

The appointment is permanent and offers scope for advancement. Applicants should apply in writing stating qualifications and previous experience to the:

Personnel Manager

JOSEPH LUCAS (CYCLE ACCESSORIES) LIMITED

Chester Street, Aston, Birmingham 6

3689

EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applications should state age, qualifications, present position and salary, previous experience and quote the appropriate vacancy number.

Lincolnshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER, LINCOLN DISTRICT (Vacancy No. 5/60).

Salary N.J.B. Class F, Grade 9, £815 × £15 to £850 per annum.

Duties of the post will be to assist in the planning, construction, operation and maintenance of underground and overhead systems up to and including 11 kV.

FOURTH ASSISTANT DISTRICT ENGINEER, LINCOLN DISTRICT (Vacancy No. 6/60).

Salary N.J.B. Class F, Grade 12, £655 × £15 to £700 per annum.

The duties of this post will be to assist in the construction, operation and maintenance of underground and overhead systems up to 11 kV.

The persons appointed to these positions will be required to reside in or near the City of Lincoln.

Applications should be addressed to the Manager, Lincoln District, Brayford Side North, Lincoln, within fourteen days of the date of this advertisement.

Ilkeston and North Derbyshire Sub-Area

FOURTH ASSISTANT DISTRICT ENGINEER, CHESTERFIELD DISTRICT (Vacancy No. 18/60).

Salary N.J.B. Class F, Grade 11, £710 × £15 to £755 per annum or Class F, Grade 12, £655 × £15 to £700 per annum, depending on qualifications and experience.

The duties will be to assist in the operation, maintenance and construction on underground and overhead systems up to 33 kV. The successful candidate must be prepared to undertake standby duties and to reside within the Chesterfield District.

Applications should be addressed to the Manager, Chesterfield District, 172, Chatsworth Road, Chesterfield, within fourteen days of the date of this advertisement. 3683

ELECTRICAL ENGINEERS

ELECTRICAL ENGINEERS are required by one of the leading manufacturers of iron and steel, to assist with the electrical engineering side of a large development programme. Candidates must have a good theoretical background and possess a degree or an equivalent qualification. Wide practical experience in manufacturing industry an advantage. Experience in iron and steel industry and particularly on continuous mills would be an asset.

Terms of service and other conditions are attractive and the housing situation is good. There is a staff pension fund and life assurance scheme.

Applications will be treated in complete confidence and should be addressed to—Box 3647.

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 45/ER/60

APPLICATIONS invited for superannuable position of STATION SUPERINTENDENT, LLYNFI POWER STATION, near BRIDGEND, GLAM.

Salary : National Joint Managerial and Higher Executive Grades, A.5, £1,540 - £1,740 per annum.

Applications, stating details of engineering and management training and experience, should be addressed to the Divisional Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, so as to reach him not later than 21st March, 1960. 3646

***Situations Vacant** (continued)*

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

LEEDS DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER (System Planning Unit).

Applicants should be Graduates of the Institution of Electrical Engineers, or hold equivalent qualifications. They must have wide experience of a large city network in design, construction, operation and maintenance, covering H.V. and M.V. overhead and underground distribution, together with substation equipment. Experience in the change-over of non-standard A.C. systems will be an added advantage.

The successful candidate will be required to reside within the District and undertake stand-by duties.

Salary N.J.B. Class K, Grade 9, £1,025/£20/£1,085 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 25th March, 1960.

No. 3 (Sheffield) Sub-Area

FOURTH ASSISTANT ENGINEER (System Standardisation).

Applicants should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification, and should have had experience in construction and operation work on M.V. and H.V. systems.

Salary N.J.B. Class M, Grade 13, £910/£15/£955 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 25th March, 1960.

No. 5 (Wakefield) Sub-Area

ASSISTANT CONSUMERS' ENGINEER (Development).

(a) Barnsley District	-	1 post
(b) Castleford District	-	1 post
(c) Doncaster District	-	1 post
(d) Wakefield District	-	1 post

The successful applicant will be required to visit and advise architects, builders, industrialists and consumers in the furtherance of electrical load development.

Preference will be given to engineers with appropriate technical qualifications who have had experience in the design of electrical space heating installations and in the organisation of exhibitions and lectures associated with load development projects.

Salary :—

(a) Barnsley District, N.J.B. Class H, Grade 10, £860 × £15 to £905 per annum.
(b) Castleford District, N.J.B. Class F, Grade 10, £765 × £15 to £810 p.a.
(c) Doncaster District, N.J.B. Class G, Grade 10, £815 × £15 to £860 p.a.
(d) Wakefield District, N.J.B. Class G, Grade 10, £815 × £15 to £860 p.a.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 25th March, 1960.

3690

SOUTH WALES ELECTRICITY BOARD

Engineering Draughtsman

APPLICATIONS are invited for the position of ENGINEERING DRAUGHTSMAN in the Mid-Wales and North Mon. District (Brecon) in the Monmouthshire and Mid-Wales Area of the Board.

The salary for the position will be in accordance with Schedule D, Grade 6 (£620/£740) of the National Joint Board Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.Sc., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Albany Chambers, Skinner Street, Newport, Mon., so as to reach him not later than Saturday, 19th March, 1960. 3613

NORTH EASTERN ELECTRICITY BOARD

Wear Sub-Area

APPLICATIONS are invited for the following appointments, which are subject to N.J.B. Agreement for the electricity supply industry. Applicants for these appointments should hold the Higher National Certificate or Higher National Diploma in Electrical Engineering or a higher qualification.

1. One SECOND ASSISTANT DISTRICT ENGINEER, Sunderland District. Applicants must have had practical training and experience in construction, operation and maintenance of H.V., M.V. and L.V. overhead and underground networks and associated plant and equipment.
   Salary Schedule A, Class F, Grade 7, £910/£955 per annum.
2. One FOURTH ASSISTANT ENGINEER, Construction Section, with location at Sub-Area Headquarters, Sunderland. Applicants must have had experience in construction of H.V. and L.V. overhead lines and installation of underground cables. Knowledge of switchgear erection and equipping of substations, etc., an advantage.
   Salary Schedule A, Class L, Grade 13, £860/£905 per annum.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 3697

NORTH WESTERN ELECTRICITY BOARD

Third Assistant Engineer (Civil Engineering), Sub-Area Engineering Department, Oldham

APPLICANTS should be suitably qualified and have had experience in preparing sketch schemes, working drawings and specifications for commercial buildings, including service centres and supervision of work on site. Membership of the Royal Institute of British Architects will be an advantage.

Salary scale £1,025/£1,085 p.a., Class L, Grade 10. N.J.B. conditions.

Applications must be made on a form to be obtained from the Manager, No. 3 Sub-Area, North Western Electricity Board, Union Street, Oldham, and returned to him so as to be received not later than 21st March, 1960.

3641

VACANCY IN SALES OFFICE

A MAN of between 23 to 35 years of age with electrical power engineering experience is required in our sales office at New Addington. The applicant should have sound technical knowledge and anyone taking H.N.C. course would be of the approximate standard.

The job is to deal with commercial and technical correspondence concerning capacitors. It is not expected that a candidate would have specialised knowledge of the product, but this would be acquired in the course of work if the individual has a suitable technical background.

There are excellent prospects for steady progress for the right man. Starting salary according to age and experience.

Applications giving age, education and experience to :—

The Sales Manager
A. H. HUNT (CAPACITORS) LTD.
Vulcan Way, New Addington
Croydon, Surrey

3533

ADMIRALTY

TEMPORARY PRODUCTION ENGINEERS required for establishments mainly in South of England. Duties cover variously production of mechanical, electrical and electronic equipment, including radar and guided missiles, design for production, advice on production methods and preparation of estimates. Must have served recognised apprenticeship or equivalent training, and possess University Degree, A.M.I.Mech.E., A.M.I.E.E., or exempting qualifications. Age not less than 25.

Salary range £780 at 25 to £1,215. Starting salary according to age up to £1,055 at 34.

Forms from Ministry of Labour, Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting C.188/OA. Closing date 25th March, 1960. 3666

ESTIMATING ENGINEERS

required by

manufacturers in West Midlands for the preparation of tenders for control equipment for nuclear and steam power stations, steelworks, machine tools, cranes, etc. Pension scheme in operation.—Box 3534.

CALTEX

THE CALTEX GROUP OF COMPANIES

require a

SENIOR INSTRUCTOR ELECTRICAL APPRENTICES

for the Training Division of their Indonesian Associates. The position calls for one-third theoretical lecturing in classrooms and two-thirds practical training in the workshop. Tours of duty are of two years' duration and based at Rumbai, Sumatra; there are generous leave provisions, allowances and pension facilities.

Applicants should be male, between the ages of 25 and 45 years, and preferably possess an Electrical Engineering Degree. They should also have had at least three years' experience in teaching electrical theory and maintenance or a combination of suitable industrial experience and teaching.

Apply in writing to

CALTEX SERVICES LIMITED

Caltex House, Knightsbridge Green, London, S.W.1

quoting "SUM."

3622

THE BAHRAIN PETROLEUM COMPANY LIMITED

a member of the

CALTEX GROUP OF COMPANIES

requires

AN ELECTRICAL ENGINEER

to perform electrical design work for their large modern oil refinery and associated facilities in the Middle East.

General requirements are :—

(a) Degree in Electrical Engineering.
(b) Postgraduate apprenticeship with a large electrical industrial organisation.
(c) A.M.I.E.E.

Candidates should also have had approximately four years' experience as a Design Engineer responsible for all the electrical aspects of power generation, distribution and industrial utilisation on systems up to and including 11 kV.

Preferred age group 28-32 years. In addition to salary, which would be dependent upon qualifications and experience, free air-conditioned accommodation and a living allowance are provided.

An initial kit allowance, medical attention, paid home and local leaves (passages paid for former and generous assistance towards the latter) are also provided, with participation in the company's pension and provident fund schemes.

Apply in writing, quoting "ETS," with full particulars of qualifications and experience to Caltex Services Limited, Caltex House, Knightsbridge Green, London, S.W.1.

3667

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER, Herne Bay/Canterbury District.
Salary £765 × £15 to £810 under N.J.B. Class E, Grade 9. Superannuable. The successful candidate will be required to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations, and with construction work. Applicants should have sound experience in electricity supply distribution and the possession of suitable technical qualifications will be an advantage. The successful candidate will be required to carry out standby duties.

Applications, quoting ER and naming two referees, to the Joint District Managers, SEEBOARD, 65, Mortimer Street, Herne Bay, Kent, by 23rd March, 1960.

FIRST ASSISTANT DISTRICT ENGINEER, Sutton District.

Salary £1,095 per annum × £25 to £1,170 per annum, plus London allowance, under N.J.B. Class G, Grade 5. Superannuable. Applicants, preferably Corporate Members of the Institution of Electrical Engineers, must have had wide experience of all aspects of underground distribution systems applicable to an intensively developed district supplying 75,500 consumers.

Organising ability and some administrative experience is an essential qualification.

Applications, quoting ER and naming two referees, on forms from District Manager, SEEBOARD, 52, High Street, Sutton, Surrey, by 23rd March, 1960.

ASSISTANT DISTRICT ENGINEER, Brighton and Hove District.

Salary £910 × £15 to £955 under N.J.B. Class H, Grade 9. Superannuable. Applicants should possess the H.N.C. in Electrical Engineering or its equivalent and have had training and experience in the construction, operation and maintenance of underground H.V. and M.V. distribution systems. The successful candidate will be required to undertake standby duties and a regular user's car allowance will be available if appropriate.

Applications, quoting ER and naming two referees, to District Manager, SEEBOARD, Electric House, Castle Square, Brighton, by 23rd March, 1960.

GEORGE WRAY,
Secretary.
3685

MIDDLESEX COUNTY COUNCIL
Education Committee

HENDON TECHNICAL COLLEGE
The Burroughs, Hendon, London, N.W.4

APPLICATIONS are invited for the post of HEAD OF THE ELECTRICAL ENGINEERING DEPARTMENT, Grade III.

The department provides a wide range of courses including "Sandwich" courses at the Higher National Diploma level and has facilities for research.

Applicants for the post should have high academic qualifications. They should also have both industrial and teaching experience and they must be Corporate Members of the Institution of Electrical Engineers.

Salary £1,800-£50-£1,950.

London Area allowance is payable in addition.

Application forms and further detailed information may be obtained (s.a.e.) from the Chief Education Officer (F1), Middlesex County Council, 10, Great George Street, Westminster, London, S.W.1. Completed application forms should be returned by 25th March, 1960.

C. E. GURR, M.Sc., Ph.D.,
Secretary to the Education Committee.
3698

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division
Technical Department

FOURTH ASSISTANT ENGINEER (Vacancy No. 61/60) required in Northfleet District.

Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualification, and be interested in automatic protective gear and control gear associated with major electrical plant in power stations and substations.

Salary within the range £775-£985 per annum with prospect of increase to £890-£1,090 per annum, all figures including London allowance, subject to satisfactory progress.

THIRD ASSISTANT ENGINEERS (Vacancy No. 62/60), Brighton and Canterbury Districts.

Candidates must possess Higher National Certificate in Electrical Engineering or equivalent qualification, and have had experience of the commissioning and maintenance of automatic protective gear and control gear of the type associated with major electrical plant in the Generating Board's power stations and substations, and of investigating faults on such plant. Ability to make calculations of balanced and unbalanced fault conditions and to write a good report is also desirable.

Salary within the range £925 - £1,140 per annum.

Superannuation and sick pay schemes in operation

Applications for all the above positions should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-on-Thames, Surrey, to arrive by 25th March, 1960.

W. H. DUNKLEY,
Divisional Controller.
3677

SOUTH OF SCOTLAND ELECTRICITY BOARD
Nuclear Generating Station

APPLICATIONS are invited for superannuable appointments as ASSISTANT SHIFT CHARGE ENGINEERS at the Board's Nuclear Generating Station which is being constructed at Hunterston, Near Largs, Ayrshire.

Candidates will be responsible for delegated duties while on shift in the operation of both nuclear and conventional plant. The minimum technical standard will be the possession of a Higher National Certificate. Previous experience in power station operation is essential. The successful candidates will be given a course in the operation of nuclear reactors.

Salary N.J.B. Class M, Grade 8, £1,270/£1,360 per annum.

Persons who made application for the above positions when previously advertised will automatically be re-considered without further application.

Applications, quoting Reference No. G8/60, on standard form available from the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, should be returned not later than Friday, 25th March, 1960. 3684

RAILWAY ELECTRIFICATION

OVERHEAD LINE MAINTENANCE STAFF

Vacancies exist on the Eastern Region Electrified Lines in the London Area

APPLICANTS selected will be engaged as ASSISTANT OVERHEAD TRACTION LINEMEN at a base rate of 181s. per week. The average earnings for this grade amount to approximately 250s. per week. Shift working is involved. Courses of instruction are given and good opportunities exist for promotion to higher grades.

Write giving particulars of age, experience, etc., to Electric Traction Engineer (London Area), British Railways, Eastern Region, off Ley Street, Ilford, Essex, or apply in person to Supervisor, Overhead Line Depot, Jutsums Lane, Romford, Essex.

Details of conditions of service, rail travel facilities, pension and sick pay schemes will be supplied at the interview.

3669

Situations Vacant (continued)

ELECTRICAL ENGINEER

required urgently in London engineering office. Age 30-45 years. University Degree or H.N.C. essential. Membership of professional institution desirable. The work entails design and specification for Electric Power Stations and Systems.

Experience essential in some of the following :—

Steam turbo-alternators.
Transformers.
H. and L.V. Switchgear.
H.V. Transmission.
Distribution.
Power Plant Instrumentation.
Motors and Starters.
Protective gear.

Good commencing salary. Pension fund. 5-day week. Luncheon club. Write details age, training and experience :—

(I.A.M./210)
BALFOUR, BEATTY & CO. LTD.
66, Queen Street, London, E.C.4

3643

CENTRAL ELECTRICITY GENERATING BOARD

Eastern Division

APPLICATIONS are invited for the following appointment :—

GENERAL ASSISTANT ENGINEERS,
RYE HOUSE
GENERATING STATION.

Salary Class G, within the range of Grades 15/13, £560 × £15 to £700 per annum, plus £90 shift allowance when required to work on shift.

The commencing salary will depend upon the duties and responsibilities.

Duties include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc. The posts will provide a suitable basis for promotion to higher technical grades.

Manual workers in skilled grades with suitable technical training will be considered. Previous experience in a generating station and/or technical training to the standard of Ordinary National Certificate or its equivalent will be an advantage.

Applications, quoting reference S.V. No. 1312, stating age, qualifications, experience and present position should be sent to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 19th March, 1960. 3612

MID AND SOUTH EAST CHESHIRE WATER BOARD

Station Superintendent

A STATION SUPERINTENDENT is required at the new filtration station of the Mid and South East Cheshire Water Board at Hurleston, near Nantwich, Cheshire. He will be responsible for the operation of these works, which provide first-class opportunities for learning advanced waterworks practice, employing modern techniques.

Applicants must have served a proper apprenticeship, be active, capable of directing small group of operatives and to plan maintenance. Preference will be given to applicants having good qualifications in electrical engineering and experience in the maintenance of electrical equipment. Mechanical experience of prime movers will be an advantage. Full training in the specialised techniques will be given.

Salary £715 to £775 p.a. plus fixed overtime of £2 12s. 6d. per week; new house at low rent of £1 per week in pleasant surroundings near attractive town of Nantwich. Superannuation.

Application form from Delwyn G. Davies, Engineer and Manager, Weaverham Grange, Hartford, Northwich, Cheshire.

Closing date Monday, 28th March, 1960.

3618

BRACKNELL DEVELOPMENT CORPORATION

Junior Assistant Engineer (Electrical)

APPLICATIONS are invited for the above appointment on the staff of the Chief Engineer at a salary in Grade II, £765-£880 per annum.

Preference will be given to applicants who have the Higher National Certificate in Electrical Engineering. The successful applicant will assist the Electrical Engineer in all matters electrical in connection with the development of the New Town and will be required to prepare schemes for electrical installations in houses, flats, commercial premises, factories, etc. Previous experience in this field will be an advantage.

Housing accommodation will be available if required. Superannuation scheme, medical examination.

Applications giving age, education, experience, qualifications and appointments held and present salary, together with two referees, should be sent to the General Manager (J.A.E.(E.)), Bracknell Development Corporation, Farley Hall, Bracknell, Berkshire, not later than Saturday, 19th March. 3676

SOUTH-EAST ESSEX TECHNICAL COLLEGE AND SCHOOL OF ART

Longbridge Road, Dagenham

REQUIRED as soon as possible :— LECTURER in Electrical Engineering to lecture to H.N.C. level in electrical subjects and in Advanced Electrical Engineering and Electrical Machines or Electricity Supply for the I.E.E. Part III Examination. Candidates should have a degree in electrical engineering or be Corporate Members of the Institution of Electrical Engineers, and have had teaching as well as industrial experience.

Salary (men) within range £1,408 to £1,601 p.a., depending on training, qualifications and previous experience.

Details and forms (stamped addressed foolscap envelope) from the Clerk to the Governors. 3703

ELECTRICAL ENGINEERING ASSISTANT

required by LONDON COUNTY COUNCIL with experience of maintenance or installation of electric LIFTS and similar equipment.

Possession of National Certificates (Electrical) an advantage. Prospects of advancement to £1,135 p.a. (under review).

Pension scheme. Staff restaurant on premises. One Saturday only worked in every five.

Application form from Chief Engineer (60/17), London County Council, The County Hall, London, S.E.1. (478.) 3692

STATION SUPERINTENDENTS

required by SIERRA LEONE GOVERNMENT Electricity Department on contract for two tours of 18/24 months each in first instance. Gross salary according to experience in scale £966 rising to £1,359 a year. Gratuity at rate 15% of total salary drawn. Outfit allowance £60. Children's allowances £48/£288 a year. Free passages for officer, wife and three children under 18 years. Liberal leave on full salary.

Candidates, between 21-40 years of age, must have served full apprenticeship with an electrical engineering company and have had several years' experience of operation and maintenance of power stations in a responsible position. They should preferably hold M.O.T. Certificate (Steam and Diesel) or equivalent. Good knowledge of power station electrical equipment desirable.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M2A/50789/EF. 3614

ASSISTANT ELECTRICAL ENGINEERS

required by
WOODALL-DUCKHAM CONSTRUCTION COMPANY LTD.

AGE 26-30; qualifications to H.N.C. or near equivalent essential; Graduateship of Institution of Electrical Engineers preferred. Some experience required in preparation of wiring diagrams for industrial power and lighting installations and in technical correspondence; also preferably knowledge of motor control gear sequence interlocking schemes, etc.

Salary in accordance with qualifications and experience. Good working conditions; staff bonus, pension and insurance schemes; 5-day week; canteen.

Apply in writing stating age, education and experience to the Personnel Officer, Woodall-Duckham Construction Company Ltd., 63-77, Brompton Road, London, S.W.3.

3619

TRANSFORMERS

GRESHAM TRANSFORMERS Limited, Twickenham Road, Hanworth, Middlesex, have vacancies for DESIGN ENGINEER; TEST ENGINEERS and DRAUGHTSMEN at senior and junior levels.

Please send particulars to the Chief Engineer.

3284

BRYCE ELECTRIC CONSTRUCTION CO. LTD.

KELVIN WORKS HACKBRIDGE SURREY

THE following vacancies exist in the Research and Development Section of this company :—

JUNIOR DEVELOPMENT ENGINEER

Applicants should be Graduate Electrical Engineers or Physicists, aged 20/25, with some laboratory or works experience.

DEVELOPMENT ENGINEER

Applicants should be Graduate I.E.E. and have a thorough practical knowledge of the design, manufacture and testing of E.H.V. power transformers up to 30 MVA. Age range 25/35.

SENIOR DEVELOPMENT ENGINEER

To take charge of Research and Development Section. Applicants must be A.M.I.E.E. or equivalent, specialists in E.H.V. techniques, preferably in connection with transformers, and be experienced Section Leaders. Age range 30/40.

These positions offer scope to self-reliant young men which will be limited only by their own ability.

Write, stating age, qualifications, experience and salary required, to Chief Engineer, at the above address.

3638

DRAUGHTSMEN

VACANCIES exist for SENIOR/INTERMEDIATE AND JUNIOR DRAUGHTSMEN with general electrical engineering experience for work in the following fields :—

POWER RECTIFIERS AND TRANSFORMERS.
VARIABLE SPEED DRIVES.

Good working conditions.

Canteen facilities. Pension scheme.

All applications in strictest confidence, quoting ref. T.J.R., to :—

LANCASHIRE DYNAMO NEVELIN LTD.
Hurst Green, Oxted, Surrey
Phone : Oxted 3361

3532

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

System Operation Department, East Grinstead

Fourth Assistant Engineer
(Vacancy No. 60/60)

APPLICATIONS are invited for this appointment at the Thames South Grid Control Centre, to assist in the Department's Planning Works and possibly to undertake occasional shift duties in the Control Room. Experience of system operation, power station or transmission practice required. Technical training to at least O.N.C. level required.

Salary within the range £735-£960 per annum with prospect of increase to within £840-£1,065 per annum when suitably experienced. Superannuation and sick pay schemes in operation.

Applications giving details of experience, qualifications, etc., should be sent to the Personnel Officer, Central Electricity House, Lower Ham Road, Kingston-upon-Thames, Surrey, to arrive by 18th March, 1960.

W. H. DUNKLEY,
Divisional Controller.

3611

Senior Draughtsmen

capable of checking, required for the design of complete electrical installations for Oil Refineries and Chemical Plants. Essential to have experience in design on large industrial contracts.

Pension and life assurance scheme.

Apply in writing stating age, qualifications and experience to :—

FOSTER WHEELER LTD.
3, Ixworth Place, London, S.W.3

3640

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

Assistant Shift Charge Engineer, Wakefield "B" Power Station

APPLICATIONS are invited for the appointment of ASSISTANT SHIFT CHARGE ENGINEER at Wakefield "B" Power Station.

The salary for the appointment will be in accordance with the National Joint Board Agreement, Schedule A, Grade 8, Class J (£1,025-£1,085 per annum) plus a 10% allowance for shift duties.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than the 21st March, 1960.

3668

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

THIRD ASSISTANT ENGINEER is required in the Protective Gear Section of the Electrical Department. N.J.B. service conditions, superannuable appointment, salary within Schedule B, Grade 6, commencing in range £925 to £1,050, ultimately rising to £1,170 per annum.

Applicants should hold a university degree, Higher National Certificate or equivalent qualifications in electrical engineering, and should have a sound knowledge of protective gear, including the commissioning of electrical plant in power stations and high voltage substations. Experience with a switchgear manufacturer would be an advantage.

Apply, quoting Vacancy No. 36/60MD on form AE6 available from the Establishments Officer, Central Electricity Generating Board, 53, Wake Green Road, Moseley, Birmingham, 13, by 21st March, 1960.

3696

LONDON ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Battersea, S.W.11.

Applicants should have a sound technical education to the standard of the Higher National Certificate and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be within the range £610 per annum rising to £745 per annum, inclusive of London allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within fourteen days of the publication date of this advertisement. Please quote ref. PER/V/2835/R.

3682

BATTERY ENGINEER

required with experience in the technical requirements of the layout and installation of Plante Batteries. Up-to-date knowledge of charging systems and control gear essential. Successful applicant will be required to collaborate with customers in the preparation of detailed schemes, to draw up specifications, and to progress to completion of installation. Previous contact with electricity boards and other large users desirable.

Post is permanent, superannuated, and has scope for advancement with independent and expanding company. Country town.

Applications giving age and experience, which will be treated in confidence, to :

Personnel Director
TUNGSTONE PRODUCTS LTD.
Market Harborough

3671

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 46/ER/60

APPLICATIONS are invited for the post of POWER STATION SUPERINTENDENT at Uskmouth "B" Power Station, Newport, Mon., which will be commissioned later this year and will have an ultimate capacity of 360 MW.

The salary will be in accordance with Class C, Grade 5 of the National Joint Managerial and Higher Executive Grades Committee (£1,940 to £2,140 per annum).

Applications, stating details of engineering and management training and experience, should be addressed to the Divisional Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, so as to reach him not later than 21st March, 1960.

3645

DESIGN ENGINEER

APPLICATIONS are invited from Engineers with qualifications of at least H.N.C., preferably in Mechanical Engineering, for design and development work on M.V. circuit breakers and fuse switchgear. Creative initiative and aptitude for design work more important than switchgear experience.

Good salary and prospects with a company near the South Devon coast. There is a non-contributory pension scheme, and housing accommodation will be available if required.

Apply giving full details of qualifications and experience to the Chief Designer, Ottermill Switchgear Ltd., Ottery St. Mary, Devon.

3620

LONDON ELECTRICITY BOARD

General Assistant Engineer

APPLICATIONS are invited for the above position. Initially the successful candidate will be located at Walthamstow, E.17.

Applicants should have a sound technical education to the standard of the Higher National Certificate and have completed a recognised period of training in the electricity industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the post within the National Joint Board Agreement, the provisional minimum salary will be within the range £610 per annum rising to £745 per annum, inclusive of London allowance.

Application form obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed within fourteen days of the publication date of this advertisement.

Please quote ref. PER/V/2799/R.

3642

COVENTRY CORPORATION

require

(a) ASSISTANT ELECTRICAL ENGINEERS, A.P.T. IV (£1,065-£1,220) or Special (£785-£1,070)

(b) ASSISTANT HEATING AND VENTILATING ENGINEER, A.P.T. IV (£1,065-£1,220)

for section responsible for design, installation by contract and direct labour, and maintenance of electrical and heating and ventilating equipment in a wide and interesting range of Corporation buildings (including re-development programme) and public lighting.

Commencing salaries in accordance with qualifications/experience. Associate Membership of Inst. E.E. or Inst. H. & V.E. desirable. Housing accommodation may be available. Removal expenses loan.

Application forms from City Engineer, Council House, Coventry, returnable by 23rd March, 1960.

3702

CLASSIFIED ADVERTISEMENTS
ARE PREPAID

Situations Vacant *(continued)*

J. & P. CAPACITOR DEPARTMENT

JOHNSON & PHILLIPS Ltd. have a vacancy in their Capacitor Department, Test Section, for a YOUNG MAN holding H.N.C. Good opportunity for a progressive man to work in a modern well-equipped factory.

Excellent canteen facilities, pension scheme, etc.

Applications giving full particulars of training and experience, together with age, to Employment Manager, Johnson & Phillips Ltd., Charlton, London, S.E.7. 3551

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

GENERAL ASSISTANT ENGINEERS (Operation) required at Portishead "B" Power Station, near Bristol.

Superannuation scheme. Salary N.J.B. Class K, Grade 13, £815-£860 per annum, plus £90 shift allowance.

Preference will be given to candidates who hold or are at present studying for a Higher National Certificate or similar qualification.

Applications on form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Rd., Bristol, 8, should be completed and returned by 18th March, 1960. Quote SW/AV/33/60. 3699

A SENIOR CONTROL GEAR ENGINEER

is required by an old-established company of Control Gear Manufacturers near London.

A top rate salary and good prospects await a really experienced and qualified man of good personality, who is required to take a leading position in the company's engineering department.

A knowledge of feed-back systems is desirable but not essential.

All information will be treated in the strictest confidence by the Secretary. —Box 3617.

ADMINISTRATIVE COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER, £780 to £1,070 according to qualifications. Candidates should be in possession of the Higher National Certificate in Electrical Engineering and be capable of preparing schemes for electrical installations in all types of buildings.

Lodging allowance and removal expenses may be paid to married men.

Apply to County Architect, 123, London Road, Leicester. 3572

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Vacancy No. 52/ER/60

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER at TIR JOHN POWER STATION, SWANSEA.

Salary H.9, £910-£955 per annum.

Applicants should possess H.N.C. or equivalent qualifications, and have had experience in a generating station.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 25th March, 1960. 3700

DOMESTIC APPLIANCE MANUFACTURER

in the North London area requires

DESIGN DRAUGHTSMAN

25-35, for work on Domestic Electrical appliances, mainly heating, cooking and refrigeration. Applicants with O.N.C. and previous experience in this field preferred. Salary according to qualifications and experience.

Apply, quoting Ref. No. J.3644, to—Box 3704.

CABLE ENGINEER

A SENIOR appointment is open for a fully qualified Cable Engineer with wide experience in the design, manufacture and testing of all types of Electric Cables.

Good prospects for a suitable applicant. Pension and life assurance scheme in operation.

Write stating age, qualifications, experience and salary required to—Box 3694.

EASTERN ELECTRICITY BOARD

Northmet Sub-Area

THIRD ASSISTANT ENGINEER, HERTFORD DISTRICT (Ref. 942). Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary N.J.B. Class G, Grade 9 (£860-£905). The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Apply by letter to W. H. Hatton-Ward, Assoc. I.E.E., A.M.B.I.M., Manager, Eastern Electricity Board, Bridgefoot, Ware, Herts., by 21st March, 1960. 3701

Senior Transformer Designer

required by

a well-established company in the South of England. Applicant should have degree or H.N.C. and preferably some years' experience with transformers up to 20,000 kVA and 66 kV, with on-load tap changing gear.

The post carries a progressive salary combined with excellent conditions of employment, including superannuation.

Written application giving full details of age, nationality, qualifications, experience and salary required to—Box 3621.

TRANSFORMER DESIGNER

Wellington, New Zealand

ASSISTANT ENGINEER required by major New Zealand distribution transformer manufacturer for design and production work. Applicants should have technical education to professional standard and works experience in power transformer design and manufacture.

Salary according to qualifications, vicinity £1,100 - £1,300 p.a.

For further information write :—

TURNBULL & JONES LTD.
Leith House, 47, Gresham Street,
London, E.C.2 3648

DORMAN & SMITH LIMITED

require experienced TECHNICAL REPRESENTATIVES (with H.N.C. or equal) for sale of company's products in London and Home Counties.

Apply 125, High Holborn, London, W.C.1, or telephone Chancery 6431. 3644

TRANSFORMER AND POWER CAPACITOR ENGINEERS

wanted for Sales and Contracts office. Preference given to candidates with H.N.C. or studying for this.

Apply :—

Sales Director
BRYCE ELECTRIC CONSTRUCTION CO. LTD.
Kelvin Works, Hackbridge, Surrey
3639

ACCOUNTS department assistant for electrical contractors, permanent position and excellent prospects for right man. Commencing salary up to £800 depending on experience. State age and experience to—Secretary, Alliance Electrical, 2, Henrietta Street, London, W.C.2 134

AN engineering insurance company requires an engineer for appointment as inspecting engineer of electrical plant. Candidates must possess H.N.C. in Electrical Engineering or equivalent and have served an apprenticeship with a manufacturer of electrical machinery. Apply in own handwriting to the National Boiler & General Insurance Co. Ltd., St. Mary's Parsonage, Manchester, 3, giving age (limits 26 to 33), training and experience, academic qualifications and copies of testimonials. Salary £800-£1,100 (progressive). Non-contributory pension scheme. 3472

BRITISH concern having extensive interests in Commonwealth West Africa require an engineer to handle refrigeration and air conditioning. Wide experience of the practical side of this work essential, with the ability to supervise site installations and plant erection using semi- and unskilled local labour. Design experience would be useful. A good starting salary is offered, coupled with generous allowances and conditions of service. This position is initially for a contract of about 12/18 months but may become permanent. Details of age, qualifications and experience to—Box 3711.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyors required in England and Scotland. Permanent positions carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 3658

CONTRACTS engineer required for inside sales post with electric switchgear manufacturers. The successful applicant will preferably be under 40 and of H.N.C. standard. Experience with switchgear and motor control gear would be considered an advantage. This post offers excellent prospects. A five-day week is in operation, together with a non-contributory pension scheme. Write giving age and full particulars of educational qualifications, experience and salary requirements to the Personnel Manager, George Ellison Ltd., Perry Barr, Birmingham, 22b. 3623

CEYLON European controlled company seek electrical engineer. Single preferred, 25-30 years of age, having sound technical and theoretical training. Higher National Certificate essential. Some experience in contracting overhaul and maintenance work. Three and a half year contract in first instance. Good salary and prospects. Write stating details, etc., to—Box Z.O.926, Deacons Advertising, 36, Leadenhall Street, London, E.C.3. 3598

CEYLON European controlled company seek mechanical engineer with sales experience for large garage organisation. Single man aged 25 to 30 years preferred. Three and a half year contract in first instance. Good salary and prospects. Write giving details, etc., to—Box Z.P.927, Deacons Advertising, 36, Leadenhall Street, London, E.C.3. 3599

CONSULTING engineers require designers and draughtsmen at all levels for electrical services. Excellent promotion prospects in rapidly expanding practice. Write—Locke & Beal, 303/307, Balham High Road, London, S.W.17. 3555

CONTROL circuit engineer and estimator for automatic motor control gear. O.N.C. or H.N.C. desirable with previous experience. Permanent and pensionable situation. Apply giving details of age, experience and present salary to the Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 3624

CROMPTON PARKINSON (Chelmsford) Ltd. invite applications for appointments in the machine department, estimating section, at their Chelmsford works. Applicants should have had a sound technical training and some experience in handling enquiries for AC and DC rotating plant and control gear up to 1,500 h.p./kW capacity. Congenial working conditions with excellent opportunities for advancement; 5-day week. Superannuation scheme. Apply in confidence stating age, whether married or single, with details of experience and training to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Chelmsford. 3444

DESIGN engineer for makers of small electrical accessories. Ample scope for personal responsibility and initiative for man with suitable experience and qualifications. Superannuation scheme, canteen, social club, assistance with removal expenses. Write giving full details to—The Wandsworth Electrical Manufacturing Co. Ltd., Albert Drive, Sheerwater, Woking, Surrey. 3537

DESIGNER/draughtsman, young, required by well-known lighting firm, to develop new designs of decorative and commercial lines. Reply stating age, salary required and experience to—Box 3653.

DRAUGHTSMAN (junior), electro/mechanical; interesting situation with excellent prospects. Apply giving full details of age, experience and present salary to the Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 3625

ELECTRICAL contractors, London, W.C.2, have opening for engineer in the design, pricing and site supervision of high-class installation work of all descriptions. The company is well known, long established and offers a good and progressive salary. Write age and full particulars of experience in confidence to—Box 133.

ELECTRICAL contractors require an estimator for industrial and commercial installations. Only fully experienced men who are conversant with all types (including FLP) need apply. Please write stating experience, qualifications and salary required to—Box 3538.

ELECTRICAL engineer required for Glasgow office staff. Applicants should have completed postgraduate training in manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 3659

ELECTRICAL engineer-surveyor for routine inspection of all types of electrical plant installed in a large group of engineering factories. Applicants should have had extensive experience with this type of plant and good theoretical knowledge. Pension scheme. Apply stating age, experience, qualifications and salary required to Personnel Manager, T.I. (Group Services) Limited, Rocky Lane, Aston, Birmingham, 6. 3649

ELECTRICAL fitters with supply industry background, preferably in semi-rural district, required as contract supervisors in West Africa. Overhead experience essential in addition general contracting. Must be capable of exercising initiative and working with minimum supervision. Write details to—Box A.D., c/o J. W. Vickers & Co. Ltd., 7, Great Winchester Street, London, E.C.2. 3626

ENGINEERS required for site testing and commissioning of switchgear installations up to and including 33 kV. Single men preferred and successful applicants will be required to travel throughout U.K. and possibly abroad. Applications giving technical qualifications, experience, age and salary required to—Box 3603.

ESTIMATING engineer required urgently by electrical contractors. Good prospects for the right man. Write stating age, experience and salary required to—Mumford Bailey & Preston Ltd., 147, Farringdon Road, London, E.C.1. 3540

INSULATION engineer, age 25-35, required to supervise routine test laboratory of a company in the South London area manufacturing electrical insulating materials. Applicants should have H.N.C. or equivalent with a knowledge of electrical insulating materials and their application. Apply in writing giving full details of qualifications and experience.—Box 9958.

MAINTENANCE electrician for motor maintenance and breakdowns, A.C. and D.C., in various factories in London area. 5½-day week. T.U. rates and conditions.—Box 3650.

MANAGER for old-estab. elec. wholesalers, Central London, specialising industrial elec. equipt., expanding business. Capable, intelligent, with initiative. Essential previous experience elec. wholesaling, buying, stock control, transport; proved ability control staff. Excellent salary, superannuation.—Box 3672.

MANAGER. Small electrical firm associated with London West End building contractors. Estimating and control of labour essential. Expansion required and bonus will be offered. Write stating age, full experience, approximate commencing salary required.—Box 3556.

MANAGING director required for small electrical contracting business, capable of large expansion. Capital not essential.—Box 3708

PARENT company wishes to increase the volume of work of its electrical contracting subsidiary. Capital and premises available. Managerial or director staff required. Business up to £50,000 p.a. London area.—Box 3707.

PROGRESSIVE and expanding electrical company with small South Coast factory needs additional directors, both technical and sales. Investment of £2,000/£3,000 preferred. Write—Secretary, J. Bull Electrical Ltd., Sutton Road, Eastbourne. 3475

REQUIRED by Siemens-Schuckert (Great Britain) Ltd., Faraday Works, Great West Road, Brentford: Electrical and/or mechanical draughtsmen for the industrial switchgear and the resistance welding departments. Experience in these products desirable but not essential. Also junior engineers for the industrial switchgear and the flameproof switchgear departments. Write to Technical Director. 3627

SALES engineer: The makers of Secomak industrial electro/mechanical equipment have an opening for an experienced representative. Apply to—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. 3629

SENIOR and junior electrical design engineers/draughtsmen required for consulting engineers' office. 5-day week, luncheon vouchers, spring and summer holidays. Applicants for senior positions must be experienced in design of electrical services for modern hospitals, universities, factories, etc. Please apply stating age, experience and salary required to—J. Stinton Jones & Partners, 21, Gloucester Place, London, W.1. 185

SENIOR designer/draughtsmen required with good electrical experience for development work. Must be capable of producing designs suitable for quantity production, and a high salary will be offered to applicants with this knowledge and experience. Apply in writing stating age, education and previous experience to—"T.M.," M.K. Electric Ltd., Shrubbery Road, Edmonton, London, N.9. 3628

SKILLED armature winders and improvers wanted, used to light to medium D.C. traction motors, also coil winders. Top rates, piecework and superannuation scheme. 42-hour week. Ideal conditions. Write or call—Nelco Ltd., Station Road, Shalford, Guildford (Tel. No. Guildford 5336). 9963

SENIOR overhead line engineer having experience in design, planning and construction of overhead lines, both lattice steel tower and pole type, up to 132 kV. Must be prepared to work both at home and abroad and should have minimum qualification of A.M.I.E.E. or equivalent. Age 35-45 years. Position is pensionable. Apply giving full particulars of qualifications and experience to—Personnel Department, Ewbank & Partners Limited, Engineering Consultants, 10-11, Grosvenor Place, London, S.W.1. 3705

TECHNICAL assistant for sales office engaged in tendering and executing contracts for transmission line insulation. Qualifications: Higher National Certificate in either Electrical or Mechanical Engineering. Previous tendering experience and ability to handle correspondence desirable but not essential. Applications should be addressed to the Personnel Officer (Staff), Pilkington Brothers Limited, St. Helens, Lancashire. 3615

TECHNICAL assistant required in electrical and mechanical engineering section, chief engineer's department, with experience of modern electrical and mechanical installations in large buildings. Experience of heating and ventilating an advantage. Graduate or associate membership of recognised professional body preferred. Up to £895 according to qualifications and experience. Pension scheme. Staff restaurant. One Saturday worked in five. Application form from Chief Engineer (60/16), London County Council, County Hall, London, S.E.1. (474.) 3693

TECHNICAL writer required for the preparation of catalogue leaflets, data sheets, maintenance instructions, etc., for motor control gear products. Write, giving details of age, experience and salary required, to—Managing Director, E. N. Bray Ltd., Britannia Road, Waltham Cross, Herts. 3709

TELEPHONE maintenance engineer required for servicing automatic and manual installations in the Newport area; also vacancies for Cardiff and Swansea areas. Permanent position with pension. Write full details, age, experience to—Reliance Telephone Co. Ltd., 18, Lawford Street, Bristol, 2. 3651

THE BOWATER PAPER CORPORATION Limited, Engineering Division, requires the services of a qualified power engineer for technical duties in connection with industrial power plant. The applicant should have practical experience in the operation of modern boiler house and turbine house equipment and the maintenance of high-pressure plant. He should also be familiar with the calculations necessary for thermal cycle comparisons in connection with new projects. The qualifications required are Graduate or Corporate Membership of the Institution of Mechanical Engineers or the Higher National Certificate in Engineering. Applications giving full details of qualifications, previous experience and salary required should be addressed to the Chief Engineer, The Bowater Paper Corporation Limited, Engineering Division, Northfleet, Kent. 3630

TRAINEE draughtsman for drawing office of electrical engineering Department. Age 17 to 20. Education to G.C.E. standard and preferably with some experience in a similar capacity. Facilities granted for further education, one day per week. Progressive position with good salary. Superannuation and life assurance scheme at age 21. Write to Personnel Manager, Granada Group Ltd., 123, Regent Street, London, W.1. 3631

TRANSFORMER engineer. Partridge Transformers have a vacancy for the post of chief engineer. Applicants must be thoroughly conversant with the design and manufacture of all types of small audio and power transformers. Write giving full particulars to the Managing Director, Partridge Transformers Limited, Roebuck Road, Chessington, Surrey. 3542

WANTED by electrical contractors in London W.C.2 area, storekeeper-general handyman. Write giving details of age, experience and salary to—Box 3654.

WELL-known and old-established electrical appliance manufacturer requires experienced representative with contacts with electrical wholesalers and boards for South London and South East England. Good salary and modern car provided.—Box 3710.

YOUNG assistant sales engineer required Kew office. Some knowledge electric motors essential. Partially qualified student or ex-apprentice considered. State age, salary, etc.—Box 3632.

Situations Vacant (continued)

YOUNG man, with first-class experience in lighting fittings trade, required to take up interesting position in connection with sales development in old-established business. Reply stating age, salary required and experience to —Box 3652.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

A YOUNG man 28, H.N.C., elect. varied experience, seeks position with progressive company in Surrey-Middlesex-London area. Interested in electrical machines.—Box 9960.

A.M.I.E.E. seeks smaller firm following merger and present surfeit of seniors. 45. Well educated. French, German. London based but used to sudden travel. Wide experience of light and medium engineering. More recently sales after many years design, production and installation. Min. starting salary £1,400.—Box 9947.

AN electrical engineer (36), H.N.C., 4-year student apprentice, experienced sales, tendering, servicing and commissioning electrical plant, requires position London area.—Box 9962.

EST. sup. engr., elec. contracting, exp. enquiry to final acct., desires position Sussex/Surrey/London.—Box 9955.

ESTIMATING and supervising engineer seeks change; 28 yrs.' contracting exp.—Box 9942.

REPRESENTATIVE in East Anglia requires post with reputable company. Good contacts with wholesale and retail trade.—Box 9957.

ARTICLES FOR SALE

600

HIGH-TENSION CIRCUIT BREAKERS

SEVERAL 11,000-volt CIRCUIT BREAKERS by G.E.C., 250-mVA rupturing capacity, fitted with 150/5 or 200/5 C.T.'s. Breakers available either for automatic or hand closing, all of the vertical isolation type, 110 volts tripping and with rear mounting busbar chambers.

SEVERAL BREAKERS of 150-mVA rupturing capacity by FERGUSON PAILIN also available. 6.6 kV and 11 kV.

400-cycle ALTERNATORS, WARD LEONARD Sets and other special electrical equipment available for prompt despatch.

GEORGE COHEN
Sons & Co. Ltd.
Wood Lane, London, W.12
(Shepherds Bush 2070)
Stanningley, Nr. Leeds
(Pudsey 2241)
3557

ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
87/89, Sterte Avenue, Poole, Dorset
(Tel.: Poole 272)
371, West Green Road, Tottenham, London, N.15 (Tel.: Bowes Park 7080) 191

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

TWW

1,010 - kVA
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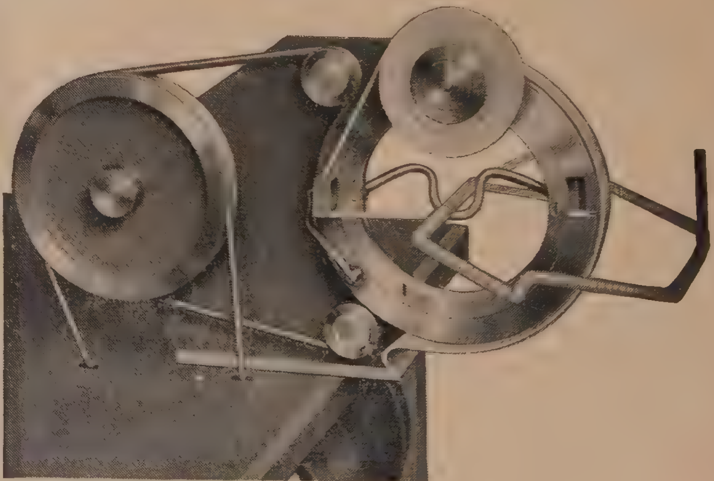

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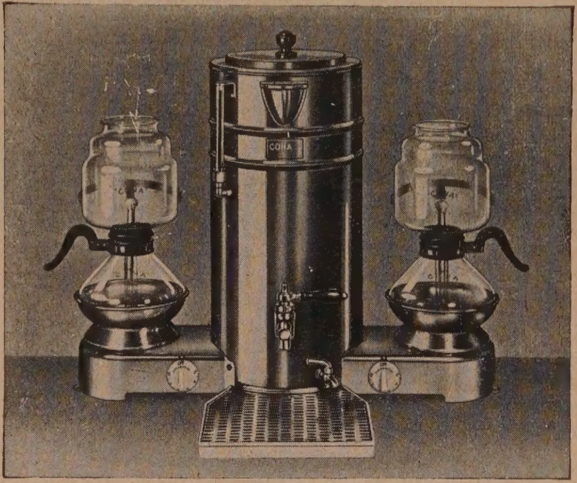

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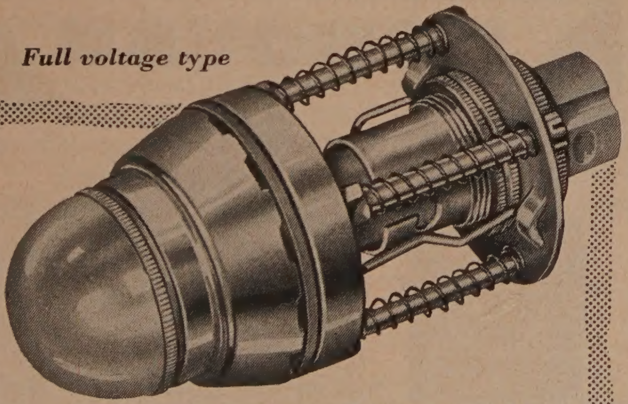

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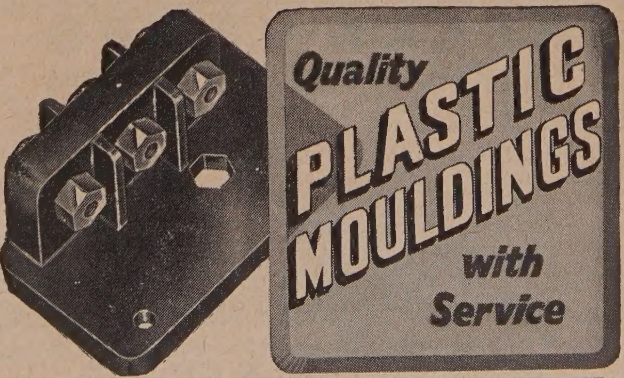

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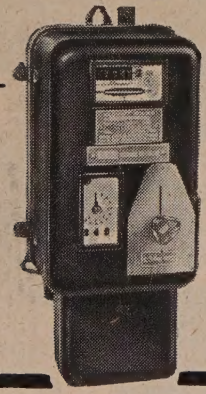

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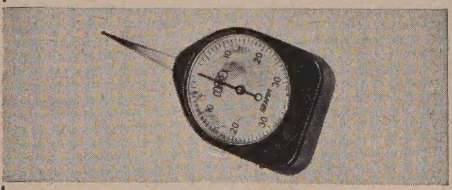

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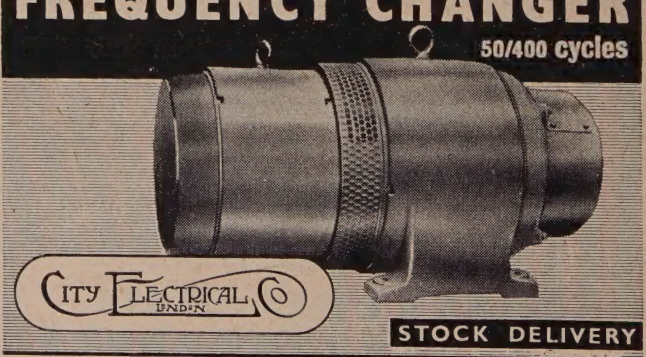

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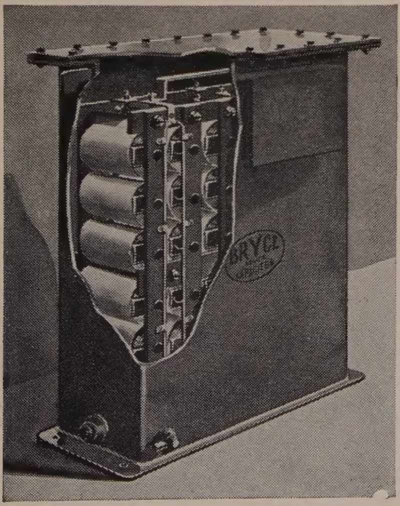

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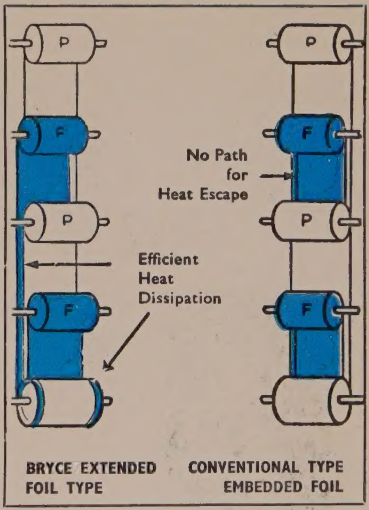

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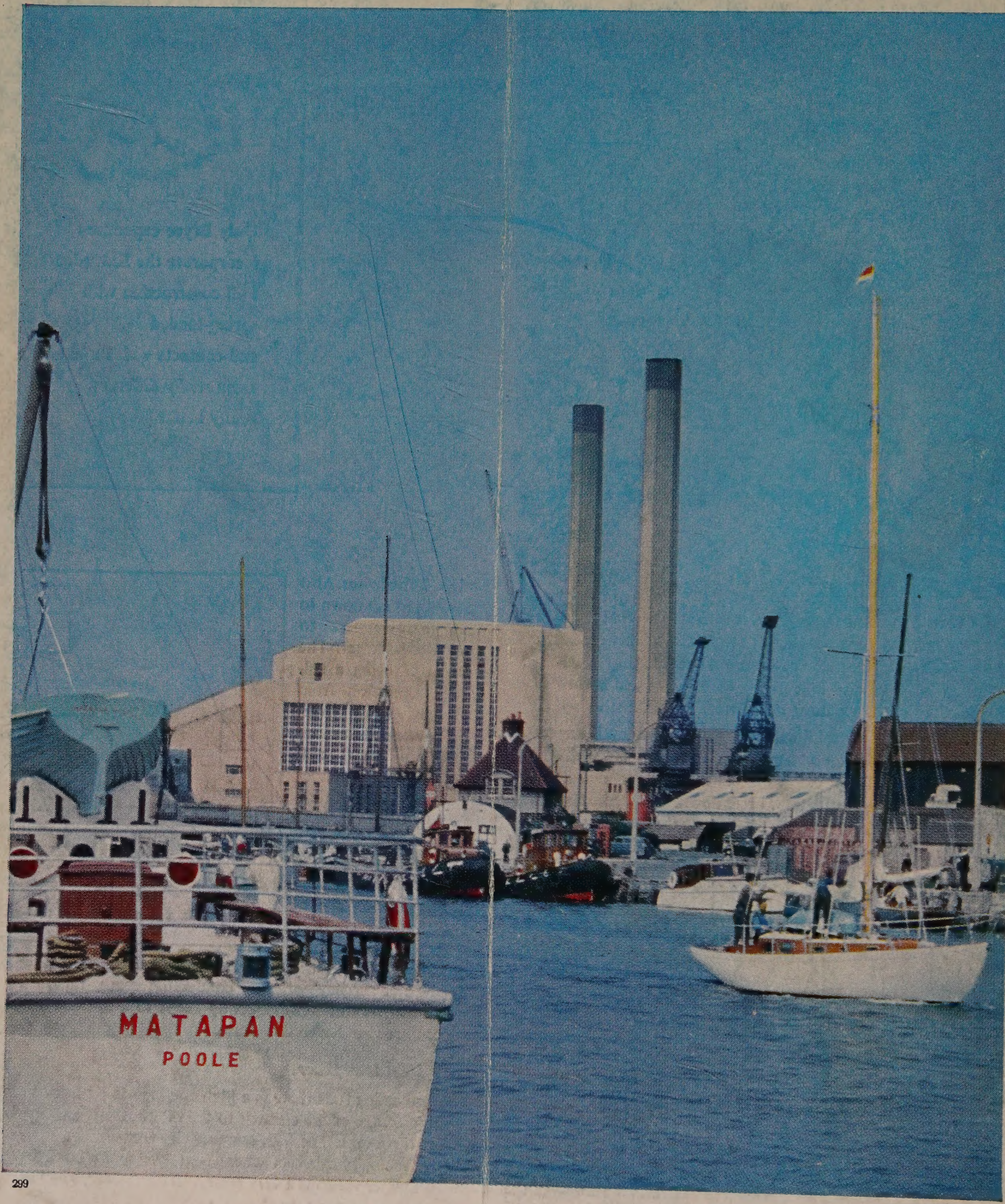

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